

process. (Details of the research are available in the online version of this article.)

One of the most discouraging findings in the project was the discovery that only nine of the original list of 1,343 studies met the standards of credible evidence set by the What Works Clearinghouse, the arm of the U.S. Department of Education that is charged with providing educators, policy makers, researchers, and the public with scientific evidence about “what works” in education. All nine studies focused on elementary schools and were conducted between 1986 and 2003. No studies of professional development at the middle school or high school levels met the WWC standards, nor did any of the studies published between 2004 and 2006.

Four of the investigations included measures of student learning in reading and language arts. Two studies focused on mathematics, one on science, and two on language arts, mathematics, and science.

demonstrating that they are effective.

e. Professional development advocates have long lamented the lack of sufficient time for staff members to engage in high-quality professional learning. Obviously, educators need time to deepen their understanding, analyze students' work, and develop new approaches to instruction. But simply providing more time for professional development yields no benefit if that time is not used wisely. An analysis by

Mary Kennedy (1998) showed, in fact, that differences in the time spent in professional development activities were unrelated to improvements in student outcomes. Why? Presumably because doing ineffective things longer does not make them any better.

In this analysis, time was found to be a crucial factor to success. While the number of contact hours ranged widely, from five to over 100 hours depending on the study, those initiatives that showed positive effects included 30 or more contact hours. It thus seems clear that effective professional development requires considerable time, and that time must be well organized, carefully structured, purposefully directed, and focused on content or pedagogy or both (Birman et al. 2000; Garet et al. 2001; Guskey 1999).

f. For decades professional development experts have stressed the importance of follow-up activities. Educators at all levels need just-in-time, job-embedded assistance as they struggle to adapt new curricula and new instructional practices to their unique classroom contexts. This analysis confirmed the vital importance of follow-up. Virtually all of the studies that showed positive improvements in student learning included significant amounts of structured and sustained follow-up after the main professional development activities.

g. Discussions about "best practices" have dominated professional development circles in recent years. Debates frequently arise from these discussions about what particular professional development activities or designs are most effective and work best (Easton 2004). Yet this analysis of well-designed studies identified no set of common activities or designs

linked to effect on student learning outcomes. In each case, the structural features of the professional development activity were determined by the specific content involved, the nature of the work, and the context in which that work took place. This corroborates the position taken by the National Staff Development Council (2001), which argues that the most effective professional development comes not from the implementation of a particular set of "best practices," but from the careful adaptation of varied practices to specific content, process, and context elements.

h. Equally debated in recent years is what professional development content is most likely to lead to improvements in student learning. The analysis noted considerable consistency regarding this aspect. The nine studies focused on specific subject-related content or pedagogic practices. In addition, most also emphasized teacher discretion in implementing that content and those pedagogic practices, justified by how students learn. In other words, the professional development efforts in every one of these investigations centered directly on enhancing teachers' content knowledge and their pedagogic content knowledge (Shulman 1986). The activities were designed to help teachers better understand both what they teach and how students acquire specific content knowledge and skill.

Interpreting the Findings

Many professional developers are likely to be surprised by these results, and some may be disappointed. Many will be stunned, just as we were, to learn that only nine investigations from a pool of over 1,300 potentially useful citations met the WWC standards for inclusion in the analysis. Obviously, these findings paint a dismal picture of our knowledge about the relationship between professional development and improvements in student learning. Such a paucity of rigorous studies of the impact of professional development on student learning outcomes was corroborated by the recent National Mathematics Advisory Panel's report (2008), which concluded that most studies of professional development in mathematics were descriptive in nature and lacking in the methodological rigor needed to warrant sound

professional development. This analysis shows simply that sound, trustworthy, and scientifically valid evidence on the specific aspects of professional development that contribute to such improvement is in dreadfully short supply and that dedicated efforts to enhance that body of evidence are sorely needed. Furthermore, this research synthesis confirms the difficulty of linking professional development to specific student achievement gains despite the intuitive and logical connection. It is hoped that a better understanding of what the current evidence reveals will help guide those efforts.

Educators at all levels need just-in-time, job-embedded assistance as they struggle to adapt new curricula and new instructional practices to their unique classroom contexts.

We also want to emphasize that the results from this analysis should *not* be taken to mean that alternative professional development activities and designs — such as coaching, the use of collective internal expertise, different allocations of time, or other types of professional development content — do not work. Rather, the results illustrate that at this time, we simply have no reliable, valid, and scientifically defensible data to show that these strategies do work. The best that can be said is that their true value has yet to be determined.

Some might argue that the “What Works Clearinghouse Evidence Standards” used to select the studies included in this analysis are unduly rigorous and that their use eliminated many good studies that other adequate but less restrictive criteria would not. Including these other studies might substantially change the complexion of the analysis and yield quite different results. Mary Kennedy’s review (1998), for example, included a different set of investigations, mostly due to different selection criteria. Using less stringent criteria could have yielded a broader range of effective professional development models, activities, and designs.

In defense of these criteria, however, we would counter that when educators ask what professional development approaches are most likely to lead to improvements in student learning, answers should be based on the most valid and scientifically defensible evidence available. The results from carefully de-

signed, experimental or quasi-experimental studies provide such evidence. Furthermore, if the advocates of alternative professional development models, practices, and designs want their approaches to gain professional credibility and acceptance, then they should take responsibility for demonstrating effectiveness through rigorous and scientifically valid means. In other words, rather than simply appealing to practitioners’ intuition and making claims of common sense, take the time to conduct thorough and systematic investigations of the true effects. Doing so will not only establish credibility, it will go far in enhancing the professionalism of our field.

Implications

The implications of this analysis for professional developers are fourfold. First, at all levels of education, those responsible for planning and implementing professional development must learn how to critically assess and evaluate the effectiveness of what they do. This means that discussions about the specific goals of professional development, what evidence best reflects the achievement of those goals, and how that evidence can be gathered in meaningful and scientifically defensible ways must become the starting point for all planning activities (Guskey 2000; Guskey 2001). Only when gathering data on the effectiveness of professional development becomes a central focus in the planning process will the pool of valid and trustworthy evidence expand.

Second, practitioners at all levels must demand better evidence from consultants and purveyors of new strategies and practices. Stories about what happened at one time in a single school or district may be interesting, but they do not justify broader implementation. What we need is trustworthy, verifiable, replicable, and comparative data. In addition, those promoting particular ideas or techniques often preface their comments with the phrase, “Research says . . .” in order to enhance presumed credibility. School-based educators must be prepared to dispute such claims, asking such questions as: “What research?” “When was it conducted?” “Was it done in contexts similar to ours?” “Are the results applicable to our setting?” and “How trustworthy are those results?” Consultants have the responsibility to know that research in sufficient depth to answer these questions. And if they do not, then at least they should have the courage and integrity to say, “I don’t know.”

Third, implementation of any new professional development strategy should always begin with small-scale, carefully controlled, pilot studies designed to

test its effectiveness. Before embracing any new strategy or committing large amounts of time, money, and other resources to any new approach, that new strategy should be carefully examined in that context to determine if the promised effects in terms of student learning gains can be realized. Comparing the

current practice and to inform future endeavors. In addition, several large-scale, randomized studies of the impact of professional development on student learning funded by the Institute of Education Sciences are now under way to answer questions that

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could not be answered in this analysis. Efforts are also being made to improve the rigor of studies specifically designed to examine this important relationship (Wayne et al. 2008). Moving in this direction will improve the likelihood of success and also elevate professional development to an inquiry-based profession, rather than a haphazard set of activities based on intuition, hearsay, tradition, and folklore. ■

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DESIGN — E S — ESIS

This board research synthesis involved a series of carefully planned steps. It began with the selection of seven electronic databases: ERIC, PsycINFO, Proquest, EBSCO Professional Development Collection, Dissertation Abstracts, Sociological Collection, and Campbell Collaboration. A deliberate identification process was used to capture relevant professional development and student learning in the core content areas: language arts, mathematics, and science. The search identified 1,343 citations as potential addresses of the impact of professional development on student learning outcomes.

Next, prescreening was performed by scanning the abstracts of all the 1,343 studies to determine if they met board eligibility and methodological criteria (e.g., an empirical study of professional development and some measure of student achievement). The prescreening process culminated in a list of 13 studies that were considered eligible for systematic review. These studies were then subjected to three stages of coding.

Stage 1 coding aimed to determine the eligibility of the studies using the following criteria:

- Topic.** The study had to deal with the effects of professional development on student learning in at least one of the core content areas (language arts, mathematics, and science).
- Population.** The sample had to include teachers or language arts, mathematics, or science and their students in grades K-12.
- Outcomes.** The study had to measure student learning outcomes.
- Study design.** The study had to be an empirical, randomized controlled trial or some form of quasi-experimental design.
- Time.** The study had to be published between 1980 and 2010.
- Country.** The study had to take place in Australia, Canada, the United Kingdom, or the United States, due to concerns about the external validity of the findings.

The results of this stage of coding yielded eligible studies that were eligible for inclusion in the study's final analysis.

Stage 2 coding focused on quality ratings of the eligible studies using the U.S. Department of Education's What Works Clearinghouse (WWC) Evidence Standards (see <http://ies.ed.gov/ncee/colle>)

eligibility criteria). At this stage, each study was given one of the following ratings in accordance with the WWC Evidence Standards:

- Meets Evidence Standards (e.g., randomized controlled trials that provided the strongest evidence of causal impact).
- Meets Evidence Standards with Reservations (e.g., quasi-experimental studies of controlled trials that had problems with randomization, attribution, teacher-implementation, or disputation).
- Does not meet Evidence Standards (e.g., studies that did not provide strong evidence of causal impact).

Of nine of the studies selected at the first or second level as having met the WWC Evidence Standards, the other 18 studies were selected at the third level: Does not meet Evidence Standards.

DATA COLLECTION

The next step in the analysis was to evaluate the selected studies on shared descriptive characteristics. Among the nine studies that met the What Works Clearinghouse Evidence Standards on causal impact, six were published in peer-reviewed journals, three were unpublished doctoral dissertations. All of the studies focused on elementary schools and were conducted between 1980 and 2010. Of the studies of professional development conducted at the middle school or high school levels met the standards, none of the studies published more recently, between 2004 and 2010.

Four of the investigations included measures of student learning reading and language arts. Two studies focused on mathematics, one on science, and two on language arts, mathematics, and science. Among the achievement measures considered, seven studies used standardized assessments of achievement, one included a self-developed measure of students' knowledge of actions, and one used Piagetian conservation tasks. The number of teachers included in these studies ranged from 1 to 44, the number of students from 10 to 1,000.

Ten of the effect sizes were computed across the nine studies, ranging from -.53 to .4. Eighteen of these effect sizes were positive, one was zero, and another was negative but not statistically significant. Eight of the effect sizes were statistically significant, and 10 were not. But among those 10, nine would be considered substantively important according

into what is called a house convention.



Following the descriptive analysis, the researchers selected these self-designed investigations to determine whether or not the professional development efforts which the focused shared common elements of characteristics. They noted that information about the professional development activities described in the studies as a composite and added in its value and effect. In addition, given an initial pool of

more than 1,300 citations that were found in electronic literature searches to be related to the needs of professional development and improvements in student learning, the researchers that met the guidelines of causal and direct relationship, modest evidence base. Nevertheless, several common elements were noted on the research synthesis. Surprisingly, these shared characteristics were not that many would have guessed, and several of the authors noted as contributing to the effectiveness of professional development ideas. ■

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