The Science of Professional Development

Janette K. Klingner

Abstract

In this commentary, I discuss the science of professional development. A great deal is already known about how to provide professional development that supports teachers' implementation of evidence-based practices and the factors that enhance or inhibit teachers' sustained use of the practices. I summarize the work of researchers who have achieved some success in facilitating teachers' learning of new practices, highlighting my own research with colleagues. Professional development is known to be most successful when (a) researchers work closely with school districts, so that everyone is on the same page, and the practices that researchers are teaching are aligned with the district's curriculum and standards; (b) student outcome data showing that the practice works are provided to all; (c) administrative support is clearly evident; (d) long-term support is provided for teachers (including demonstrations and coaching); and (e) teachers take ownership of the practices and responsibility for mentoring their peers.

> Student Success = Validated Interventions + Service-Delivery Systems + *Professional Development* Programs. (Deshler et al., 2001; emphasis added)

Crockett (in this issue) asks, "In the complexities of the contemporary schoolhouse, how can we foster the delivery of effective instruction so that each student with LD receives the appropriate interventions to learn and teachers receive the support they require to do their jobs and to stay with them?" These are critical questions. Crockett then asks us to consider four ideas for linking school practices with educational research: (a) Turn to science as the best way we know to solve educational problems; (b) specify clearly what we are hoping to achieve in our instructional decisions for students with learning disabilities (LD); (c) rely on instruction as the best tool we have for improving student performance; and (d) cultivate and keep competent and caring personnel. In responding to these ideas, my comments have a two-part focus on what we know about providing professional development that supports teachers' implementation of evidence-based practices and on the constellation of factors that enhance or discourage the sustained use of desirable practices (Gersten, Chard, & Baker, 2000).

The Science of Professional Development?

Vaughn and Dammann (2001) defined science as "an approach to the development of a consistent, documented system of knowledge based on rigorous, systematic, objective observations that lead to hypotheses or theories that are then tested and refined in an iterative process" (p. 22). They noted that a systematic body of knowledge provides a stronger foundation for a theory of education than do alternatives to science, such as superstition, folklore, and craft. Over the years, I and my colleagues have been accumulating evidence about "what works" when providing professional development in evidence-based practices to educators, and we now know a great deal more than we did a decade or so ago about how to support teachers as they develop new expertise and skills. As Crockett (in this issue) notes, "the cultivation of competent and caring personnel need not be left to chance, thanks to the emerging knowledge base surrounding personnel issues and efforts with sustaining the use of research-based practices." We have developed a body of knowledge based on "rigorous, systematic, objective observations" (Vaughn & Dammann, 2001, p. 22). In the first part of this discussion, I summarize what we have learned about professional development related to improving practices for students with LD.

The majority of past professional development programs were marginally successful at best. There are many possible reasons why they were less than effective. The National Joint Committee on Learning Disabilities (NJCLD; 2000) described previous professional development activities as too linear or top-down in approach, characterizing them as "sit and get" sessions, in which relatively passive participants were made aware of the latest ideas regarding teaching and learning from "experts." Such professional development programs were organized around brief workshops that were insufficient in

duration or depth to bring about sustained, substantive change in practice (Abbott, Walton, Tapia, & Greenwood, 1999; Malouf & Schiller, 1995; NJCLD, 2000).

Rather than the "sit and get," stand-alone workshops more prevalent in the past, successful efforts by special education researchers have focused on providing long-term support and including teachers as collaborators in the process. Teachers are no longer seen as mere "consumers of research findings" but rather are recognized as "knowledge generators" (Gersten, Vaughn, Deshler, & Schiller, 1997, p. 472). Effective professional development programs are "dynamic and integrated" (NJCLD, 2000, p. 3) and address the organizational, systemic, and cultural supports that are necessary (the *context*); the content-specific knowledge, skills, and attitudes needed (the *content*); and the way in which knowledge, pedagogy, skills, and attitudes are acquired (the *process*; NJCLD, 2000). Continuous evaluation of student outcomes must be a driving force in shaping plans.

Successful efforts are facilitated when researchers (a) ensure that there is feasibility and fit of the practice in teachers' classrooms; (b) demonstrate both the general value of the practice and its potential for improving student performance; (c) help teachers understand how the new practice differs from what they have been using; (d) provide coaches and mentors to work with teachers; (e) maintain open lines of communication with school personnel; and (f) provide materials and other resources (Fuchs & Fuchs, 1998, 2001; Gersten et al., 1997; Klingner, Arguelles, Hughes, & Vaughn, 2001; Klingner, Vaughn, Hughes, & Arguelles, 1999; Taylor, Nelson, & Adelman, 1999). Educators benefit from long-term support that facilitates their understanding and implementation of new strategies. This support may include background reading, watching videotapes of the strategy, observing live models in the classroom, and coaching from more expert sources. Teachers need to see concrete examples of how a new theory, principle, or instructional practice relates to their students and their circumstances. If teachers do not see the relevance of the strategy to their situation, little change is likely to occur (Englert & Tarrant, 1995). By adapting a new strategy to fit their needs, teachers make the strategy more relevant to their classrooms and develop a sense of ownership, promoting its sustained use in their classrooms. A community of support among teachers and researchers can assist teachers in their shift toward improved practice (Gersten et al., 1997; Pressley & El-Dinary, 1997).

Overcoming Barriers to Implementing New Practices

For researchers to be successful at facilitating the sustained use of research-based practices, it is important to understand just what teachers perceive to be the greatest barriers they face in their efforts to implement new practices, as well as what helps them overcome these barriers. Two common barriers are a lack of time to implement programs and inadequate support from administrators (Ayres, Meyer, Erevelles, & Park-Lee, 1994; Klingner et al., 1999; Stanovich & Stanovich, 1997; Taylor et al., 1999). Another barrier is a lack of materials. Mastropieri and Scruggs (1998) found that even though their teachers were eager to use mnemonic materials to improve their students' academic achievement, they were limited by the availability of mnemonic instructional materials. Other barriers include high-stakes testing, pressure to cover content, a mismatch between teacher style and the practice, and not having an in-depth understanding of the practice.

Gersten et al. (1997) noted six principles that can break down barriers to implementation and help researchers to guide teachers' efforts in sustaining the use of research-based practices. The first is the *reality* principle, which refers to the feasibility and fit of the practice to the classroom. The second principle is *scope*. If the scope of the change is too broad or too radical, practitioners are likely to feel overwhelmed. Conversely, if the scope is too narrow, teachers are likely to feel that the change is trivial and therefore will not likely be sustained. *Technical* and *conceptual* aspects of change are the third and fourth principles. Technical aspects of change refer to the amount of feedback and support that practitioners receive. Conceptual change referes to the idea that sustained change is more likely to occur when teachers understand the significance of the new practice, when they understand how these practices differ from those they have been using, and when they see the benefits of the new practice over the old one. The fifth principle, *linking changes in teaching to student learning,* refers to student performance; the better students perform when using the strategy, the more motivated teachers are to use it. The final principle is *collegial support networks.* Only with support from principals, researchers, and other teachers will innovative practices be sustained in classrooms.

Researchers Bridging the Research-to-Practice Gap

Greenwood and colleagues (e.g., Abbott et al., 1999; Greenwood, Tapia, & Abbott, 2001), Fuchs and Fuchs (e.g., 1998), Pressley and El-Dinary (1997), and Vaughn and colleagues (e.g., Vaughn, Hughes, Schumm, & Klingner, 1998) have been among the most successful researchers in establishing long-term collaborative partnerships with schools as a way to enhance the sustainability of research-based practices. Yet it is important to note that despite their successes, these research partnerships also faced challenges, and the implementation of target practices has been uneven across schools and teachers.

Abbott et al. (1999) with the Juniper Gardens Children's Project were able to sustain ongoing interactions with teachers by targeting problems

they considered relevant, identifying solutions, and evaluating progress. Yet the implementation of their research-based practices differed across their three schools. Two partnerships were successful, and one was not. The lessons learned were that (a) a partnership cannot develop without strong grassroots support from teachers; (b) translating research knowledge into a form that is useful for teachers is a major, time-consuming task; (c) teacher participation needs time to grow from year to year; and (d) it is essential to help teachers learn to link changes in practice directly to changes in student performance.

Fuchs and Fuchs (1998) have achieved some success in bridging the research-to-practice gap with their *Peer-Assisted Learning Strategies.* They developed a long-term model that included pilot research, formal evaluation, and scaling up. Teachers were partners throughout this process—they were involved in planning research activities, implementing research-based practices, providing feedback, and problem solving. Teachers indicated in various ways how connected they felt to the research process. Yet the challenges were sometimes formidable. The state's adoption of a new high-stakes achievement test created a high-anxiety climate that made partnerships more susceptible to misunderstandings and mistrust. Fuchs and Fuchs noted that their partnerships with practitioners survived only when both sides worked continuously to preserve the alliance. Like others, they emphasized that helping teachers to learn and sustain research-based practices was a major undertaking.

Pressley and El-Dinary (1997) described how they and their colleagues investigated teachers' implementation of reading comprehension strategy instruction over 7 years. They achieved considerable success but also faced many challenges. Pressley and El-Dinary concluded that complex models of comprehension strategy instruction appeal to and are possible for only some teachers. They emphasized the importance of providing technical and conceptual support for teachers through long-term collaboration that involved respectful and understandable communication, as well as videotapes, modeling, and coaching.

Vaughn et al. (1998) provided an intensive, year-long professional development program in reading to 12 general and special education teachers in two schools. Participants learned the following three research-based, multilevel instructional practices associated with enhanced reading outcomes for students and feasible for general education teachers to implement:

1. *Partner Reading,* adapted from *Classwide Peer Tutoring* (CWPT; Delquadri, Greenwood, Whorton, Carta, & Hall, 1986) and *Peer-Assisted Learning Strategies* (PALS; Mathes, Fuchs, Fuchs, Henley, & Sanders, 1994)
2. *Collaborative Strategic Reading* (Klingner, Vaughn, & Schumm, 1998)
3. *Making Words* (Cunningham & Cunningham, 1992)

Vaughn et al. described the implementation of the target practices by seven general education teachers during the initial year they learned the practices and during the following year. All but two of the seven teachers partially or completely implemented the practices during the obligatory 9-week period. Implementation during the remainder of the school year was maintained by four of the seven teachers. Three of the teachers continued to implement the instructional practices at high levels during the following year.

Lessons Learned From My Research

Klingner, Hughes, Vaughn, and colleagues (Klingner, Ahwee, Pilonieta, & Menendez, 2003; Klingner, Ahwee, van Garderen, & Hernandez, in press; Klingner et al., 2001; Klingner, Vaughn et al., 1999) investigated the sustainability of the practices learned by teachers in the professional development program described by Vaughn et al. (1998). Our focus for 4 years was on (a) bridging the research-to-practice gap in reading instruction for students with LD through extensive professional development and (b) understanding the barriers and facilitators to teachers' sustained use of the practices. We began our sustainability research by going back to the schools and teachers who had participated in the professional development program described by Vaughn and her research team. In subsequent studies, we expanded our efforts to include additional schools and teachers.

Barriers and Facilitators

In our first study examining the sustainability of previously taught practices (Klingner et al., 1999), we examined the extent to which the cadre of teachers who participated in the professional development program described by Vaughn et al. (1998) had sustained their implementation of the targeted reading instructional practices. Teachers were observed and interviewed 3 years after their involvement in the program to determine the extent to which they continued to implement the practices, the ways in which they modified them, and the factors that influenced their sustained use of the practices. With the exception of one teacher, the teachers continued to implement one or more of the three practices at a high rate. Teachers reported that factors that *enhanced* their sustained use of the practices included the following:

1. *Support networks.* A support network that included other teachers, paraprofessionals, or individuals from the university enhanced teachers' implementation (e.g., "because we are all doing it").
2. *Administrative support.* Teachers knew that the instructional practices were important to their principal and that the principal expected to see them in the classroom.

3. *Student benefits.* Teachers identified student benefits as a strong influence on their sustained use of practices.
4. *Student acceptance.* Teachers were much more likely to continue using a practice if their students liked it and were enthusiastic about it.
5. *Flexibility of the practice.* When teachers perceived that they could modify the practice to suit their instructional style or their students' needs, they developed more ownership of the practice.
6. *Readily available materials.* Teachers reported that they simply did not have time to hunt around for materials, find books, or make materials on their own, so the availability of materials influenced the extent to which they implemented a practice.

Teachers also identified factors that *impeded* their sustained use of practices:

1. *High-stakes testing.* Teachers felt intense pressure to prepare their students for the state-level assessments, and to do this they needed to use published test preparation materials.
2. *Content coverage.* Teachers were concerned with depth versus breadth—although they recognized that covering content was not the same as knowing it, they still felt pressure to get through the textbook or curriculum.
3. *Time constraints.* Numerous mandates to do other things meant that teachers needed to adjust what and how they taught to meet competing demands.
4. *Mismatch between teacher's style or personality and the instructional practice.* Some teachers indicated they were not comfortable implementing a particular practice (e.g., "cooperative groups just don't click with my personality").
5. *Forgetting.* Some teachers offered forgetting to use a practice or forgetting how to use it as reasons why practices were not sustained over time.

Factors That Facilitate Lasting Change

Next, we investigated the extent to which other teachers in two of the elementary schools described by Klingner et al. (1999) and Vaughn et al. (1998) were using the reading instructional practices taught to a cohort of their colleagues 3 years previously. We had continued to provide ongoing informal support and wished to determine the extent to which the practices had *spread* to other teachers in the original school and in a second school (Klingner et al., 2001). Furthermore, we wished to learn *why* teachers who had not been a part of the original professional development program chose to learn and sustain use of the practices. We found that 93% of the 98 teachers in these two schools had tried at least one of the practices, and more than half continued to use one or more practices on a sustained basis. The practices clearly had become part of the pedagogical culture of each school. When teachers were asked why they chose to learn one of the instructional practices and why they continued using it, their primary reason was student benefits. We concluded that lasting change is facilitated through

1. clear expectations from the principal that a practice is important;
2. a community of practice in which teachers feel empowered to seek and provide help to their peers;
3. research results that clearly link an instructional practice with improved student outcomes;
4. resources that support implementation (e.g., materials); and
5. flexibility to modify a practice to fit the needs of teachers and students.

Scaling Up

Next, we attempted to scale up the implementation of the three original reading practices, *Partner Reading* (Delquadri et al., 1986; Mathes et al., 1994), *Collaborative Strategic Reading* (Klingner et al., 1998), and *Making Words* (Cunningham & Cunningham, 1992), and a fourth reading practice, *Phonological Awareness* (Torgesen & Bryant, 1994). Through an intensive 2-week reading institute with extensive follow-up support, we taught the practices to 29 teachers across six elementary schools who worked in classrooms that included students with special needs (Klingner, Ahwee, Pilonieta, & Menendez, 2003). Our objective was to better understand the barriers and facilitators to practice usage experienced by teachers who were determined to be high implementers (9), moderate implementers (9), and low implementers (11) of the practices. Teachers across implementation levels lamented a lack of instructional time due to various competing demands, such as high-stakes testing or updates of Individualized Education Programs (IEPs). Yet how teachers dealt with these barriers differed, with high implementers describing more benefits to the practices (e.g., enhanced student outcomes). Also, high implementers reported administrative support as their top facilitator, whereas the majority of moderate implementers claimed that their principals did *not* support them. School effects were noted.

We concluded that the most important group to investigate more closely might actually be the *moderate* implementers. It seems that when a relatively effective professional development model is implemented, we can expect that there will be teachers at one end of the continuum who will be able to overcome barriers and put into practice the new strategies they learn, and at the other end of the continuum there will be teachers who will not implement the practices despite substantial support. Therefore, it is those teachers in the middle, who would seem most likely to go either way, for whom additional support becomes most critical. Future research should explore these issues. Our data indicated that the moderate implementers in this study

valued our weekly presence in their classrooms but would have benefited from more administrative support, more assistance in learning the critical components of the strategies, and more information about student benefits.

The most important lesson we learned in this study was that scaling up is not simply a matter of doing more of the same on a larger scale. In our previous school-based work, we had taken a grassroots approach to professional development, working with teachers who then spread the word from teacher to teacher in a bottom-up fashion. This was successful up to a point. Yet, for large-scale implementation to occur, clearly there must be "buy-in" by stakeholders at multiple levels. Unless reading leaders, district- and school-level administrators, and teachers take over ownership of the practices, it is unlikely the practices will take hold and spread. This calls for a qualitatively different kind of involvement from multiple stakeholders, including researchers, administrators, policymakers, and teachers. As described by Darling-Hammond and McLaughlin (1995), what is needed is "top-down support for bottom-up reform."

Professional Development

Recently, we described a 7-year partnership between researchers and an urban professional development school (Klingner, Ahwee, van Garderen, & Hernandez, in press). During this period, students' test scores rose dramatically, and the school is now considered to be a shining example of what is possible in low economic areas (e.g., in a nationwide analysis, they were selected as a high-performing school; Jerald, 2001). Given the partnership's success, we wished to understand how and why it began, what sustained it, the challenges it faced, and the recommendations for improvement. Our primary focus was on the professional development component of the partnership as a way to affect school change. The results indicated that administrative leaders' and teachers' beliefs that they would be learning cutting-edge instructional practices were strong motivators in facilitating the start of the partnership. Once begun, the partnership was sustained because the perception by all was that it was successful. Administrators and teachers, convinced by high-stakes test data, firmly believed that student achievement increased because of the partnership. They gave credit for their gains on the state's mandated tests to the instructional practices they learned through professional development activities, the presence of university faculty to provide guidance, and their involvement in research.

The partnership was not without its challenges, however. A substantial challenge initially was that teachers were afraid to be judged by visitors to their classrooms. They also were worried that researchers would report their activities to the administration. These teachers did not share their concerns with us until after the fact, years later, when they knew us well. It took time and patience to establish trust, to get to know one another, and to build relationships and an adequate comfort level. Thus, the demeanor of researchers should be nonthreatening and nonjudgmental. Teachers perceived that we respected them as experts in their classrooms—as professionals—and that helped a great deal.

In conclusion, these lessons learned from research suggest that the professional development school model, when combined with a strong research component and instruction in research-based strategies, can be an effective way to bring about school change and affect student outcomes.

Conclusions and Recommendations for Practice

To bring about the sustained implementation of research-based practices, ongoing professional development is critical. Yet this professional development must take into account what researchers have learned about maximizing its effectiveness (see Figure 1). Professional development is most successful when the following elements are in place:

1. researchers work closely with school districts, so that everyone is on the same page and the practices that researchers are teaching are aligned with the district's curriculum and standards;
2. student outcome data that show the practice works are available (teachers say that their top motivator to keep using a practice is seeing that their students are benefiting);
3. administrative support is clearly evident;
4. long-term support is provided for teachers as they try implementing new practices in their classrooms (including demonstrations and coaching); and
5. teachers take ownership of the research-based practices they are taught as well as responsibility for mentoring their peers.

Furthermore, professional developers should keep in mind that "one size does not fit all" any more with teachers than with students. Teachers have different internal characteristics and work in diverse contexts with varying external pressures, and it is important to consider these complex factors when planning for and conducting professional development programs. Some teachers seem to require a great deal of support to implement new practices—and even with extensive support, they may not sustain the practices once they are on their own. On the other hand, some teachers learn new practices relatively quickly, can make informed decisions based on evidence in their classrooms and with their students, and can adjust their instruction accordingly. Other teachers fall somewhere in the middle. Sophisticated professional development programs should take this into account, adjusting support as necessary and enlisting those teachers who are most

Facilitators

Ongoing Assistance and Support

Coaches and mentors to provide feedback, help problem solve, and provide assistance with learning the critical components of practices
Opportunities to observe demonstrations of the practices
Administrative support (e.g., clear expectations that practices are important, scheduled time for planning and implementation, help with resources, a reward structure)
A community of practice (i.e., a network of teachers using the practices who dialogue, help one another, and encourage risk taking)
Help with materials and other resources

Positive Student Outcomes

Research results clearly linking enhanced student achievement with the practice
Students' liking the practice

Strong Relationships Among Researchers, Teachers, Administrators, and District Leaders

Relationships built over time on trust and mutual respect
Open lines of communication

"Buy-In"

Strong grassroots support from teachers, and time and space for participation to grow from year to year
Teacher involvement in planning, providing feedback, and problem solving
Transfer of ownership of the practices from researchers to teachers
Buy-in by stakeholders at multiple levels (i.e., teachers, administrators, and district leaders)
Belief by teachers that they are learning cutting-edge instructional practices

Feasibility and Fit

Feasibility and fit of the practice in teachers' classrooms (the reality principle)
Flexibility to modify a practice to fit the needs of teachers and students

Barriers

Competing Demands

High-stakes testing (and pressure to engage in test preparation activities)
Pressure to cover content ("breadth versus depth"—some instructional practices, such as comprehension strategy instruction, take longer than traditional methods)
Time constraints (i.e., multiple demands on time)

Lack of Supports

Inadequate support from administrators
Insufficient support from the researchers providing professional development
Lack of appropriate materials (including published materials)
Mismatch between teacher's style or personality and the instructional practice
Not having an in-depth understanding of the practice and its critical components
Forgetting to use a practice, or forgetting how to use it

FIGURE 1. Summary of facilitators and barriers to the sustained use of evidence-based practices. *Note.* Sources: Abbott et al., 1999; Englert & Tarrant, 1995; Fuchs & Fuchs, 1998, 2001; Gersten, Morvant, & Brengelman, 1995; Gersten et al., 1997; Gersten et al., 2000; Klingner et al., 1999; Klingner et al., 2001, 2003; Mastropieri & Scruggs, 1998; NJCLD, 2000; Pressley & El-Dinary, 1997; Stanovich & Stanovich, 1997; Vaughn et al., 1998; Vaughn, Klingner, & Hughes, 2000.

successful with new practices in providing assistance to their peers.

In conclusion, the following recommendations are offered for researchers involved in professional development activities designed to improve outcomes for special education students (Vaughn, Klingner, & Hughes, 2004):

District level

1. Include school district personnel in identifying the instructional practices they want teachers to learn and to sustain.
2. Include school district personnel while planning professional development programs and mechanisms for providing follow-up support and determining accountability.

School level—principals

1. Engage school administrators in discussions about how to support teachers' efforts to implement new practices (e.g., conveying that the practices are important, rewarding implementation, providing help with materials, scheduling time for planning).
2. Limit requests for teachers to learn or implement other, competing practices while the targeted instructional practices are being learned and implemented.

School level—teachers

1. Communicate effectively to teachers the importance of the

targeted instructional practices and why it is valuable and important for them to be sustained.
2. Provide sufficient ongoing support to ensure that the targeted practices are acquired by teachers to a level at which they can be used independently and automatically.
3. Provide systematic and ongoing feedback to teachers about student progress as related to the implementation of the target practice.
4. Identify teachers who are implementing the practices effectively, and facilitate opportunities for other teachers to observe in their classrooms and for them to demonstrate in other classrooms.
5. Provide time for teachers to plan how they will implement the target practices, implement the practices, talk with other teachers about issues related to the practices, develop and share materials related to the practices, and reflect and communicate with others who know and use the practices.
6. Establish trust and build relationships with teachers—the demeanor of researchers should be nonthreatening, nonjudgmental, and respectful of teachers' expertise and the day-to-day challenges they face.
7. Provide teachers with opportunities (time and space) to adjust and fine-tune the instructional practices to work in their setting with their students.

Overall, we know many facilitators that are associated with improved outcomes from professional development as well as barriers that are likely to impede the effectiveness of professional development (see Figure 1). However, knowing what these factors are is considerably different from being able to effectively implement them in a systematic and ongoing way with all professional development efforts. Such work is time-consuming and labor intensive. Schools seem to be determined to make changes, not all of which are for the better and many of which impede the effective implementation of sound practices that have been launched through professional development programs.

ABOUT THE AUTHOR

Janette K. Klingner, *PhD, is associate professor of bilingual special education at the University of Colorado at Boulder. Her research focuses on professional development and the sustainability of evidence-based practices and reading comprehension strategy instruction. Address: Janette K. Klingner, University of Colorado at Boulder, School of Education, 249 UCB, Boulder, CO 80309-0249; e-mail: janette.klingner@colorado.edu*

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