TN EDUCATION RESEARCH ALLIANCE

Tennessee's Professional Learning Challenge: Aspirations, Assumptions, and Knowledge Gaps

A Brief on Reimagining State Support for Professional Learning

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About this Brief

Drafted as background for a convening to set a research agenda, this brief discusses the need for new knowledge on how the Tennessee Department of Education can best promote effective professional learning for educators across the state.

Part I summarizes current assumptions about the state role in professional learning and how new research might build the state's capacity. Part II provides a brief discussion of existing research on the topic.[2]

A subsequent brief will outline the research priorities agreed to by the researchers and practitioners who took part in the convening for which this document was prepared.

ASSUMPTIONS ABOUT THE STATE'S ROLE IN PROFESSIONAL LEARNING

Professional learning is critical, but highly challenging to do well. That appears to be the consensus view at a time of increased interest in professional learning among policymakers and practitioners. As the thinking goes, the right activities, conditions, and supports can help teachers transform their practice in ways that lead to greater student learning—but those ingredients are seldom present. Faced with this disconnect between what teachers need and what they are getting, state education officials in Tennessee and elsewhere are asking how a state department of education can best promote effective professional learning across schools and districts in different contexts. But any attempt to answer that must begin with an understanding of current assumptions about professional learning, about what underlies those assumptions, and about the biggest gaps in the existing knowledge base about professional learning.

Why the Renewed Interest in Professional Learning in TN

Measures of student performance indicate noteworthy gains in Tennessee over the past several years. On the National Assessment of Educational Progress (NAEP) in some grades and subjects the state has risen to about the national average *(see Figure 1)*. These gains coincided with a concerted statewide push to articulate more rigorous academic standards and to build state and local capacity to identify effective teaching through more consistent educator evaluation.

FIGURE 1

TN'S SCORES HAVE RISEN TO ABOUT THE US AVERAGE ON THE NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS

4TH GRADE MATH

4TH GRADE READING

8TH GRADE MATH

8TH GRADE READING
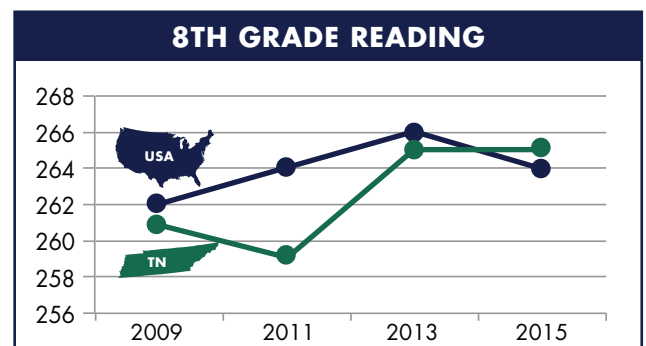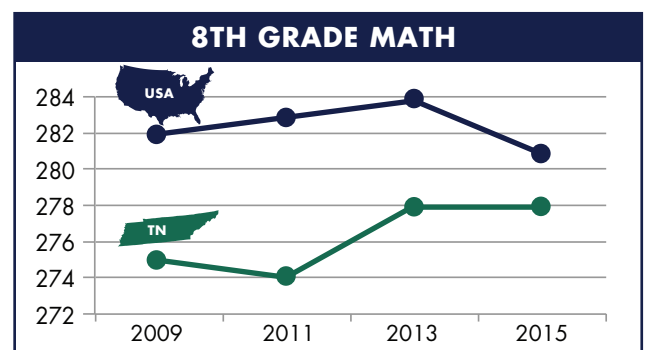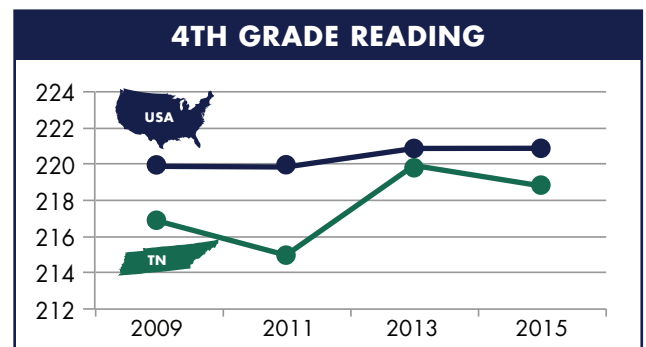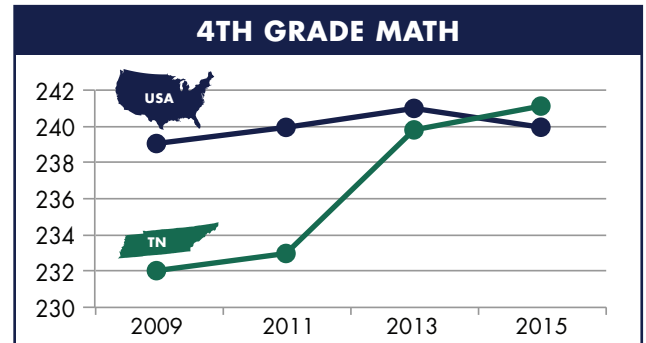
Despite these gains, there is widespread agreement among policymakers and practitioners that the state must continue to improve, and that more of the same initiatives are unlikely to get the state where it aspires to be. About half or more of Tennessee's ACT takers still do not score at a level required by most colleges and universities. Moreover, in many grades and subjects, students from traditionally disadvantaged subgroups score half as well, or even lower, than their peers on state assessments—at a time when students in such subgroups make up two-thirds of the state's nearly 1 million students.[3]

In 2016, after gathering extensive stakeholder input, the Tennessee Department of Education outlined a set of ambitious education goals for the next several years. These are:

- *Tennessee will rank in the top half of states in reading and math on the 4th and 8th grade NAEP by 2019.*
- *By 2025, 75 percent of third graders will be proficient in reading, up from less than half now.*
- *By 2020, the average ACT score of Tennessee test takers will be at least 21, signaling readiness for postsecondary education.*
- *The majority of high school graduates from the class of 2020 will earn a postsecondary certificate, diploma, or degree.*

To focus its efforts in helping schools achieve these goals, the state department put forth a set of priorities in its new strategic plan, "Tennessee Succeeds." One priority is to transform literacy instruction in the early grades. Another is to better support students in making the transition from high school to postsecondary education.

Chief among the state's strategic priorities is supporting educators by bolstering district development of more effective, personalized professional learning. This work will include tools that allow for better tracking and assessment of results, as well as efforts to improve both the accuracy of teacher evaluation and the quality of the feedback educators receive.

> The question before the state is: How can we best promote professional learning and educator feedback that supports teachers in making changes in their practice that, in turn, help more students become college- and career-ready?

Helping all students meet the current demands of college and career readiness is a significant challenge. It requires major instructional shifts from what most educators have experienced and were prepared to do by their preservice training. These shifts entail not just new techniques, but also different ways of thinking about the goals and processes of teaching.[4] That teachers must learn to do many things differently is little disputed among practitioners, as is the view that such learning is unlikely to result from "traditional" professional development (e.g., one-shot workshops).

The question before the state is how to best promote professional learning and educator feedback that supports teachers in making changes in their practice that, in turn, help more students become college- and career-ready by the time they graduate high school *(see Figure 2, on page 5)*.

Although the state education department has some capacity to provide direct training to school- and district-based educators, most of the agency's levers for influencing instruction involve no direct contact with those who actually teach, and indeed are typically several steps removed (e.g., published guidance, or approval requirements for teacher preparation programs). Districts play a much more direct role in shaping teachers' professional learning activities and the conditions in which they take place. Statewide improvements require a state-level strategy, but any such strategy must align with and work through locally directed efforts to promote activities that reflect the current best thinking on effective professional learning.

Among the current assumptions about professional learning:

Continuous improvement at scale requires a systematic approach. Practitioners and researchers know of instructional improvement practices that they think are effective based on the success of some programs (teacher collaboration, coaching, etc.). In reality, the results are mixed, and there are few clear examples in the United States of sustained effective professional learning at scale, at least beyond a teacher's first few years on the job. There is plenty of evidence that even professional learning experiences that claim to follow best practices have little or no impact on improving teacher effectiveness.[5]

How people work needs to change. Change at scale is not a matter of implementing individual programs but of fundamentally changing the way professionals think about and go about their work. Examinations of high-performing school systems around the world describe a constellation of policies and practices that together organize educators' jobs around the work of improving effectiveness.[6] As those examinations have shown, changing how people work may require creating new leadership positions, such as that of professional learning leader.

Professional learning must support subject-based student learning goals. Useful professional learning is focused on important things that teachers need to teach their students. Although

effectiveness also depends on format and mode of delivery, professional learning is of little use if, as the University of Michigan's David K. Cohen has posed, teachers are "learning to teach nothing in particular."[7] Effective professional learning at scale may require development and dissemination of more subject-based curricular guidance. It also will likely require tapping deeper expertise in subject-specific pedagogy (e.g., the different ways students respond when grappling with a particular domain-specific concept.)

Conditions are a key factor in effectiveness. Whether or not professional learning improves outcomes has a lot to do with the context in which it takes place. Success may require changing conditions (e.g., changing schedules to give teachers more time for collaborative professional learning; or pushing leadership mindsets from one of "meeting compliance" to "developing competency.")[8] The field needs to learn what conditions lead to successful professional learning so it can better foster them.

Contextual differences call for a flexible approach. If conditions are both key to success and they differ across the state, then any state approach needs to be adaptable to different contexts. Moving toward an effective system of professional learning in small rural districts will require a different approach than doing so in large metro areas. The state can set some "guardrails" for how local systems operate, but they need to allow for customization. The previously mentioned reviews of high-performing systems in other countries generally describe a "tight-loose" approach, in which accountability and supports set general expectations, but the specifics of what happens in professional learning is locally determined.[9]

Informal professional learning plays an important role. Teachers engage in professional learning informally every day, and many see these informal activities as more beneficial to their practice than formal experiences.[10] Teachers also value feedback and collaboration, but feel they don't get enough of either.[11] Understanding more about the role that informal learning plays, and how to best leverage and enhance that role, is important to envisioning an overall system of professional learning.

FIGURE 2

TENNESSEE'S PROFESSIONAL LEARNING CHALLENGE:
THE VIEW FROM THE STATE

STUDENT LEARNING FOR COLLEGE & CAREER READINESS
- **Foundational Literacies:** In ELA, math, science, civics, etc.
- **Competencies:** Critical thinking, collaboration, problem solving, communication
- **Character Qualities:** Curiosity, initiative, persistence, adaptability, etc.[I]

In TN: Average ACT scores have improved, but about half of seniors still do not score at a level required by most colleges and universities.[II]

TEACHING FOR COLLEGE & CAREER READY STUDENT LEARNING
- **Equitable & Ambitious:** Engages all learners in higher-order learning activities while at the same time developing their foundational literacies and procedural fluencies.[III]
- **Emphasis on Depth & Content:** Focused on deep understanding of a few key concepts, on connections within & across grades, and on students' effective use of evidence.[IV]

In TN: Ratings of teacher practice are lowest on use of questioning, critical thinking, and problem-solving.[V]

EFFECTIVE PROFESSIONAL LEARNING
Content-based, collaborative, extended duration, opportunities for practice & feedback [VI]

In TN: Teachers value collaboration the most, but only 32 percent say it's given enough time.[VII]

CONDUCIVE PROFESSIONAL ENVIRONMENTS
Supportive leadership, safe & orderly, mutual trust, evaluation for improvement [VIII]

In TN: Teachers who get feedback say they use it, but only 58 percent say they get such feedback.[IX]

STATE LEVERS
- **State-Provided Training** (e.g., for Read to Be Ready coaches)
- **Optional programs** (e.g., pairing teachers through the Instructional Partnership Initiative)
- **Guidelines** (e.g., Response to Intervention manual)
- **Requirements** (e.g., for educator prep programs, PD credits, teacher & leader evaluation)
- **Facilitating Networks** (e.g., districts collaborating in the Tennessee Early Literacy Network)
- **Incentives** (e.g., retention bonuses for effective educators)

DISTRICT LEVERS
- **Personnel Decisions** (e.g., valuation, observation, recruitment, retention, and promotion of teachers and leaders, etc.)
- **Training** (e.g., new teacher induction, curriculum training, etc.)
- **Scheduling** (e.g., time for teacher collaboration, etc.)
- **Facilitating networks** (e.g., across schools, among teachers and school leaders)
- **District-wide initiatives** (e.g., continuous improvement models)

FOCUS OF NEEDED RESEARCH

I World Economic Forum (2015). "What are the 21st Century skills every student needs?"

II Tennessee Department of Education (TDOE), "Tennessee Succeeds" (2016)

III Jackson, K. & Cobb, P. (2010) "Refining a Vision of Ambitious Mathematics Instruction to Address Issues of Equity." AERA paper presentation

IV TDOE, Tennessee State Academic Standards

V TDOE Evaluation Data

VI Desimone, L. (2009) "Improving Impact Studies of Teachers' Professional Development." *Educational Researcher*

VII TDOE, (2016) Educator Survey

VIII Papay, J., and Matthew Kraft (2016). "The Myth of the Performance Plateau." *Educational Leadership*

IX TDOE, (2016) Educator Survey

A Need for New and Different Research

While the assumptions on the previous pages may represent current thinking, there's little consensus on how to apply that thinking in a set of state activities that has the desired effect on professional learning. Indeed, many of these assumptions need testing, and may need to be refined or discarded. What seems clear is that the current research base is insufficient to solving this puzzle. In part this is due to the nature of most research on professional learning to date, an issue some academics have noted.[12] Among the issues they cite:

Focusing exclusively on programs. When the research question is merely "does this program work or not?" we miss the crucial insights into the "why" that can support better design of professional learning. The fact that some 1:1 coaching models produce positive results and others don't suggests that effectiveness depends on something other than the general format of 1:1 coaching; knowing what that may be would be immensely helpful.

Focusing only on process and not function.[13] The design of professional learning also is informed when we have a clear window into "how" it works. Many studies cite time for collaboration as a key to effectiveness, but it seems important to also know what happens during that time, and how those activities may contribute to teacher learning and any improvements in their practice.

Assignment or self-selection issues. While randomized control trials (RCTs) provide confidence in results, those results may not always be generalizable. If the goal is effective professional learning at scale, then we need to know that our efforts aren't just effective among teachers and schools that volunteer to take part in pilots—or conversely, that a lack of effectiveness wasn't due to participation being mandatory. The conditions for effective "take-up" must be understood.

Another overarching issue is the difference in time horizons between the worlds of research and practice. A large-scale RCT of a program may take 3-4 years from start to publication; in 3-4 years, Tennessee will have passed the dates for most of the milestones in its strategic plan. It's also worth noting

that each year some 70,000 students pass out of our system;[14] the time we have to better prepare any one student for the future is necessarily limited.

Despite these challenges, there is reason for optimism about the prospects for a body of useable knowledge on professional learning. The field has developed much more valid and reliable measures of student learning, teacher knowledge, and teacher practice than were available in the past, allowing researchers to go beyond teachers' self-reported outcomes as the indicator of effectiveness. The field also is gaining experience with promising new research methods. A growing number of districts are tackling complex challenges with "Improvement Science," the problem-solving approach born in the health care field that combines systems thinking with quick turnaround, small-scale tests.[15]

A useful set of research studies on this topic must be more than the sum of their parts. More than knowledge of what works, what is needed is a more productive way of thinking about how to promote effective professional learning across Tennessee. One model for this is the "On-Track" to high-school success work of the UChicago Consortium on School Research. Over a number of years, the Chicago Consortium carried out multiple studies of varied size and method that together contributed to a new way of thinking about how to best support students' success in high school.[16]

Prior to that work, conventional wisdom was that requiring more rigorous high school coursework and related assessments would boost student performance. But through a series of analyses, informed by on-the-ground practitioners, the UChicago researchers zeroed in on the 9th grade as a significant point that determined the likelihood of a student succeeding in high school and beyond; 9th grade student performance was among the strongest predictors of student success going forward. With this realization, the consortium identified a set of indicators for whether a 9th grader is "on track" for graduation, and it started providing high schools with reports on the extent to which their incoming students were on track. This work is credited with bringing greater coherence among school, district, and nonprofit actors as they focus their efforts on improving Chicago's results, which have indeed seen gains.[17]

The Chicago example suggests some of what success would look like for an integrated research agenda. An integrated research agenda focused on the state role in promoting effective professional learning would help practitioners better understand the nature of the problem, and the best points for leveraging change. It would drive stakeholders toward a coherent set of solutions, and, ultimately, measurable improvements in professional learning, teaching, and student outcomes. Those are the goals as the Tennessee Education Research Alliance plans a set of studies for the coming months and years.

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In a recent report that jolted many practitioners, TNTP (formerly The New Teacher Project) summed up the state of teacher professional learning by stating: "We bombard teachers with help, but most of it is not helpful."[19] As the authors noted, we invest enormously in professional development in the United States, but with apparently little, if any, benefit to teacher effectiveness. Across three districts studied, additional years of experience did not translate into more effectiveness for the average teacher, with the exception of teachers in their first years on the job. The average fifth year teacher looked a lot like the average 25-year veteran. Moreover, among the few outperformers the report found no common experiences to suggest a set of promising strategies for professional learning.[20]

Those assertions have fueled deep concern among many practitioners who see professional learning as essential to supporting students in becoming college- and career-ready. What if, despite what seemed to be a growing consensus in the field, we don't really know what works for professional learning? That would be a sobering conclusion given that helping all students meet college- and career-ready standards—with their heavy emphasis on critical thinking alongside foundational literacies—will require profound shifts in instructional practice.

But other studies suggest that it would be a great overstatement to say that, as far we can tell, nothing works. To be sure, many rigorous studies of thoughtfully d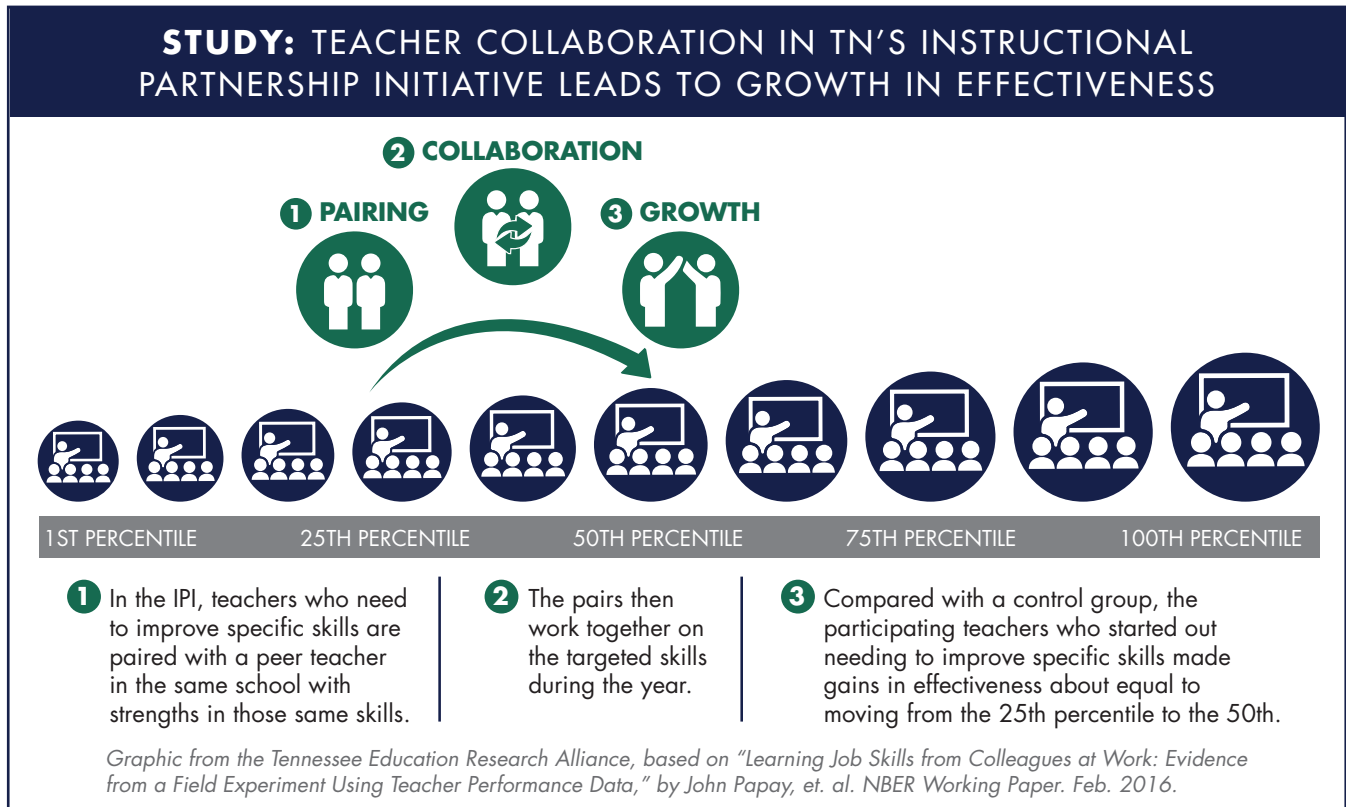esigned professional development have found no effects on student outcomes. That was the conclusion of a recent summary of three major studies sponsored by the Institute for Education Sciences. Randomized control trials of two PD programs in math, and one in reading, showed no benefit to student achievement—even though all three programs included characteristics thought to be marks of high-quality professional development (including a content-specific focus, between 68-110 hours of contact time, and a mix of group sessions and individual coaching).[21] But other rigorous studies paint a somewhat different picture. To give two examples:

- *A random assignment experiment examined the impact of year-long intensive 1:1 video-based coaching by highly-trained coaches, and found that teacher participation in the program led to greater student learning. Researchers noted that the resulting gains were the equivalent to moving a student from the 50th percentile to the 59th percentile in terms of student achievement.*[22]

- *Student learning increased when teachers were randomly assigned to a pilot of Tennessee's Instructional Partnership Initiative (see Figure 3), in which teachers are paired with colleagues based on matched success and opportunity identified through teacher observation data and given little more direction than to work together over the course of the year to improve their practice. The average observed gains in teacher effectiveness were the equivalent of moving a teacher from the 25th percentile to the 50th.*[23]

Meanwhile, reviews of research on professional learning approaches are fairly consistent in pointing to a set of characteristics associated with effectiveness *(see Table 1)*. In addition, analyses that look at the returns-to-experience question from different angles suggest that many teachers do, in fact, improve throughout their careers.[24] Some of this work also points out that a veteran teacher's contribution to student learning in a school likely goes beyond that seen in the teacher's own classroom. As an example, a seasoned educator may, through formal or informal mentoring, raise the performance of their novice colleagues.

Instead of "nothing works," a more accurate assessment might be that "some things work, when done certain ways or in certain contexts." What seems unambiguous is that we haven't cracked the code for making professional learning work at any great scale.

FIGURE 3

STUDY: TEACHER COLLABORATION IN TN'S INSTRUCTIONAL PARTNERSHIP INITIATIVE LEADS TO GROWTH IN EFFECTIVENESS

② COLLABORATION

① PAIRING   **③** GROWTH

1ST PERCENTILE   25TH PERCENTILE   50TH PERCENTILE   75TH PERCENTILE   100TH PERCENTILE

① In the IPI, teachers who need to improve specific skills are paired with a peer teacher in the same school with strengths in those same skills.

② The pairs then work together on the targeted skills during the year.

③ Compared with a control group, the participating teachers who started out needing to improve specific skills made gains in effectiveness about equal to moving from the 25th percentile to the 50th.

Graphic from the Tennessee Education Research Alliance, based on "Learning Job Skills from Colleagues at Work: Evidence from a Field Experiment Using Teacher Performance Data," by John Papay, et. al. NBER Working Paper. Feb. 2016.

In another close-to-home example of promising practices—identified by analyzing state teacher evaluation data—analysts at the Tennessee Department of Education examined what happened when the state provided 200 teachers with extensive training on instructional coaching and on math instruction aligned to Tennessee's Common Core State Standards. When those teachers went on to provide similar training to other teachers, the teachers they trained performed measurably better on related measures of effectiveness.[27]

Instead of "nothing works," a more accurate assessment might be that "some things work, when done certain ways or in certain contexts." What seems unambiguous is that we haven't cracked the code for making professional learning work at any great scale. Whether the trajectory of teacher effectiveness really plateaus or merely gets increasingly shallow as novices gain experience, school systems appear to be largely unsuccessful in promoting most teachers' professional growth to where they can help most students meet rigorous standards.[28] While we still surely have much to learn about the characteristics of effective professional learning, the bigger gap

in our knowledge is about how to make effective professional learning universal. How do we effect enough change in the system so that all teachers, in all schools and at all points in their careers, are becoming increasingly effective?

A Broader View of What Matters

Recognizing just how far we are from the goal of universal access to effective professional learning, some policy thinkers are urging the field to think much bigger than discrete programs with narrow objectives. What's needed, in this view, are fundamental changes in the way schools operate, and in the way that educators go about their daily work. As a new guide on this topic from Learning Forward and Education Counsel suggests, "our goal isn't just to improve professional development experiences, but to endeavor to make each school a learning system for students and teachers."[29]

Some illustrations of what this looks like are in the widely circulated report "Beyond PD: Teacher Professional Learning in High-Performing Systems,"

an in-depth examination of policy and practice in four systems that consistently outscore the U.S. in international comparisons of student learning: Shanghai, Singapore, Hong Kong, and British Columbia.[30] In all four, a central feature is an ongoing improvement cycle in which groups of teachers in individual schools assess student learning needs to identify goals, develop and implement instructional practices, and evaluate the impact of those practices to plan refinements and next steps.

To many, this central feature may sound like the kind of Plan-Do-Assess professional learning community model that many U.S. schools have been claiming to employ for decades. What sets the "Beyond PD" systems apart, as described in the report, is the degree to which the improvement cycle work is central to teachers' practice. In the four systems studied, the effectiveness of that cycle is buttressed by an array of structures and policies that provide guidance and accountability. Chief among them:

- *Distinct roles with clear expectations and extensive training for leaders of professional learning; and*

- *Recognition of success in developing teacher expertise—through performance reviews at all levels, but also by sharing school-based research.*

Another factor was time. In most high performing systems, teachers spend fewer hours teaching than in the U.S., giving them more opportunity to develop their practice.

TABLE 1

CHARACTERISTICS OF EFFECTIVE PROFESSIONAL LEARNING SUGGESTED BY RESEARCH

From "Beyond PD's" Summary of Five Major Reviews of Research:[25]

Collaboration
- Participation in a professional community—focused on teaching-learning links—that supports new ideas and practice and challenges existing ones.
- Discussion with colleagues, observing peers, and professional networks.
- Ongoing access to newly developed knowledge and expertise of colleagues within and beyond one's own school.

Active Inquiry
- Developing the skills of inquiry to judge the impact of teaching on learning, and to identify next steps.
- Learning and practicing instructional behaviors and the development of lesson cycles.
- Observing expert teachers and being observed, followed by interactive feedback discussion.
- Analyzing student data and taking part in practice-related research activities.

External Input
- Experts external to the group who can present new ideas in ways that promote teacher engagement.

Coherence
- Consistency of school, district, and state reforms and policies with the focus on professional development.
- Consistency with teachers' conceptions and current research.

Additional characteristics from other research reviews:[26]

Content Focus
- Learning opportunities that focus on subject matter content and how students learn that content.

Sufficient Duration
- In both the total number of hours and the span of time over which the hours take place.

Practice based
- Opportunities to reflect on and grapple with challenges in teachers' current practice.

This broader view of the interplay between professional learning formats and the contexts in which they occur calls to mind a growing strand of research on conditions. One of the best known is the longitudinal study of 100 Chicago schools by the UChicago Consortium on School Research, which produced the consortium's "Five Essentials" for school improvement *(see Box 1)*.[31] Schools with strong indicators of at least three of these five conditions were 10 times more likely to experience improvements in student learning than schools with weak supports.

Other research has examined more directly the relationship between a school's professional climate and improvements in teacher effectiveness. John P. Papay and Matthew A. Kraft, both at Brown University, identified items on a working conditions survey to create a measure of a school's professional environment *(see Box 2, next page)*.[32] Using the instrument to study schools in Charlotte-Mecklenburg, N.C., they found that, over time, teachers working in schools at the 75th percentile on the measure improved 38 percent more than

BOX 1

THE **U**CHICAGO CONSORTIUM'S
5 ESSENTIALS

1. **Coherent instructional guidance**, including shared tools, materials, and routines that articulate "the what and how of instruction."

2. **Professional capacity**, that is, the ability to work together to improve instruction—a function of recruitment, retention, and "the efficacy of performance feedback and professional development."

3. **Strong parent-community ties**, a major factor in student motivation.

4. **A student-centered climate**, one that is safe, supportive, orderly, and focused on learning.

5. **Leadership that drives change**, by influencing core instructional programs, hiring and developing staff, building trust, cultivating other leaders in the school, and "buffering externalities that might distract from coherent reform."

teachers at the 25th percentile. Indeed, the schools at the 75th percentile in terms of professional environment appeared to go beyond, by a significant degree, the five-year plateau; on average, the teachers in those schools continued to improve in years 5-10 (albeit not as dramatically as in their first years on the job.)

Any read of existing research makes clear the need to be simultaneously open minded and skeptical about investigations into professional learning. Broad claims based on isolated studies (e.g., "1:1 coaching is effective," or "essentially nothing works") do little to help move practice in productive directions. The bigger benefit to the field will likely come from a more nuanced and complete picture that gets pieced together by looking beyond average results, and by reconciling different findings that view the problem from different angles. In this view, the result won't be a silver bullet, but more likely "silver buckshot."

The Tennessee Education Research Alliance is committed to helping build a more complete picture of what works in professional learning,

KRAFT & PAPAY'S MEASURE OF PROFESSIONAL ENVIRONMENT

Both new and experienced teachers improved more in their effectiveness in schools that scored well on:

ORDER & DISCIPLINE: the extent to which the school is a safe environment where rules are consistently enforced and administrators assist teachers in their efforts to maintain an orderly classroom;

PEER COLLABORATION: the extent to which teachers are able to collaborate to refine their teaching practices and work together to solve problems in the school;

PRINCIPAL LEADERSHIP: the extent to which school leaders support teachers and address their concerns about school issues;

PROFESSIONAL DEVELOPMENT: the extent to which the school provides sufficient time and resources for professional development and uses them in ways that enhance teachers' instructional abilities;

SCHOOL CULTURE: the extent to which the school environment is characterized by mutual trust, respect, openness, and commitment to student achievement;

TEACHER EVALUATION: the extent to which teacher evaluation provides meaningful feedback that helps teachers improve their instruction, and is conducted in an objective and consistent manner.

and why, so that policymakers and practitioners can make better informed decisions about how to support educators in their professional growth. The next brief in this series on reimagining state support for professional learning will outline a set of research priorities agreed to by stakeholders and scholars convened by the alliance earlier this year. Subsequent briefs and reports will relate findings from new research on professional learning in Tennessee, and how it might be improved.

NOTE: *The Tennessee Education Research Alliance invites readers to share their thoughts and questions about this brief by emailing:* tned.research.alliance@vanderbilt.edu.

1   Jeff Archer, a former writer and editor at *Education Week,* is the president of Knowledge Design Partners (www.knowledgedesign.org).

2   While this document includes research citations, the aim is not to provide a comprehensive academic review. Instead, the brief summarizes a series of discussions with state education leaders (from the department of education and across Tennessee) about the role of the state in teacher professional learning.

3   See: Tennessee Department of Education. "Tennessee Succeeds: Where Are We Going? How Will We Get There?" 2016.

4   There are numerous examples of attempts to summarize college- and career-ready knowledge and skills for the 21st Century. The one adapted for Figure 2, on page 5, comes from "What are the 21st century skills every student needs?" on the website of the World Economic Forum. The description of "Ambitious & Equitable" teaching in Figure 2 is adapted from the AERA paper presentation by Jackson, K., and Cobb. P. "Refining a Vision of Ambitious Mathematics Instruction to Address Issues of Equity", 2010.

5   See Garet, M., et al. "Does Content-Focused Teacher Professional Development Work? Findings From Three IES Studies", 2016.

6   Jensen, B., et al. "Beyond PD: Teacher Professional Learning in High-Performing Systems", Learning First. 2016.

7   Cohen, David K. "Learning to Teach Nothing in Particular: A Uniquely American Education Dilemma", *American Educator*, 2010.

8   Papay, J., and Matthew Kraft "The Myth of the Performance Plateau". *Educational Leadership,* 2016.

9   Jensen, B.. 2016

10   TNTP. "The Mirage: Confronting the Hard Truth about Our Quest for Teacher Development." 2015.

11   See Tennessee Department of Education, Annual Tennessee Educator Survey. 2016.

12   See Hill, Heather, et al. "Professional Development Research: Consensus, Crossroads, and Challenges". *Educational Researcher.* 2013.

13   See Kennedy, Mary, "How Does Professional Development Improve Teaching?" *Review of Educational Research*. 2016.

14   Tennessee Department of Education data.

15   See Bryke, Anthony S., et al. *Learning to Improve: How America's Schools Can Get Better at Getting Better.* Harvard Education Press. 2015.

16   See Roderick, Melissa., et al. "The Consortium on Chicago School Research: A New Model for the Role of Research in Supporting Urban School Reform", The UChicago Consortium on School Research. 2009.

17   See Allensworth, Elaine and John Q., Easton "What Matters for Staying On-Track and Graduating in Chicago Public High Schools", The UChicago Consortium on School Research. 2007.

18   We greatly appreciate Heather Hill (Harvard Graduate School of Education) for taking the time to share with us her insights from her own review of the existing research on professional learning.

19   TNTP, 2015.

20   One noteworthy difference among improvers and non-improvers is that the former had a much more accurate assessment of their own performance levels. Non-improvers, who made up the vast majority of teachers, had inflated views of their own effectiveness.

21   Garet, M., et al., 2016.

22   Allen, Joseph P. "An Interaction-Based Approach to Enhancing Secondary School Instruction and Student Achievement", *Science.* 2011.

23   Papay, J., and Matthew Kraft. 2016

24   Papay, J., and Matthew Kraft "The Myth of the Performance Plateau". *Educational Leadership,* 2016.

25   Jensen, B. et al. .2016. The "Beyond PD Summary of Evidence on Effective Professional Learning" is included in a separate appendix to the full Beyond PD report. The research summary is based on review of the following studies:

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