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Designing Better Professional Learning with the Brain in Mind

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Bryan Goodwin & Kris Rouleau

Let's face it. Many teachers dread in-service professional development sessions, which gives rise to tongue-in-cheek memes floating around the internet, like the one that shows a picture of exhausted teachers sitting in a PD session above the caption, "When I die, I hope it's during an in-service session because the transition to death would be so subtle."

Too often, teacher PD is slow-paced, disconnected from teachers' needs, heavy on theory and light on practical application, and delivered in a "sit and get" lecture-style format. These sessions provide too few opportunities for teachers to actively discuss, practice, and reflect on the new knowledge and skills. In short, this type of PD is the opposite of the learning experiences we expect teachers to provide for their students.

So, it's not surprising that the PD many teachers and school leaders experience just doesn't work. Many studies have concluded that PD does little to change educator practices (e.g., TNTP, 2015) and meta-analytic reviews have reported disappointingly small effect sizes of professional learning on student achievement (Blank & de las Alas, 2009).

That's the bad news. Here's the good news: When properly designed, professional learning can have meaningful impact on educator practices and student achievement (Guskey & Yoon, 2009). Moreover, decades of research shows that "no [school] improvement effort has ever succeeded in the absence of thoughtfully planned and well-implemented professional development" (Guskey & Yoon, 2009, p. 496).

In short, teachers do need professional learning—but they need it to be *good* professional learning. They need the learning they experience to reflect what we know about how our brains work and what we've learned from research about effective adult learning.

Here at McREL, we've synthesized decades of cognitive science (a.k.a. the science of learning) into a six-phase model of student learning that we are helping teachers embed in their classrooms to create more effective and joyful learning experiences for students. Not surprisingly, the very same principles that work for student learning also apply to adult learning. After all, how people learn—that is, how our brains convert new information into long-term memory—really

> ## Defining Terms:
> ## What's the difference between PD and PL?
>
> Although these terms are often used interchangeably among educators across the country, McREL distinguishes professional learning (PL) from professional development (PD). PD is typically something done *to* teachers in a one-size-fits-all fashion. It's a one-time training event, workshop, or seminar, with little or no expectation of ongoing coaching and reflection to help teachers use what they've learned in their daily classroom practices. PL, on the other hand, is something we do *for* and *with* teachers. It's ongoing, job-embedded learning that meets teachers where they are and, most importantly, engages them in making substantive changes in their practice to better serve their students.

doesn't change much as we age (Bransford et al., 1999). And that's good news, especially for anyone who's responsible for designing and delivering adult learning. The more we can design teachers' professional learning experiences to match how their brains work, the better we'll be in creating effective and engaging learning experiences for adults.

A six-phase model for adult learning

In this paper, we're sharing an overview of the six phases of learning (which you can read about in more depth in *Learning That Sticks*). And we'll show how these phases are reflected in scientific studies and meta-analyses of research on professional learning.

The findings from these studies are hardly earthshaking. We've long known what's required to engage teachers in rich learning experiences that help them improve their professional practices. Over the years, many organizations and academics have done a good job synthesizing these findings into valuable

frameworks for professional learning that help professional developers wrap their arms around the essential elements of professional learning.

What's new here, though, is sequencing these elements into a* model *of professional learning.

What's the difference between a framework and a model? In our work with school systems worldwide, we find that many already use *frameworks* for teaching, which can be helpful in identifying the myriad practices and behaviors teachers are expected to demonstrate in their classrooms (often on their performance evaluations).

Yet frameworks do little to help teachers understand how to design and deliver effective learning experiences for students. That's where *models* come in: They offer step-by-step guidance that clarifies, for example, how to sequence learning experiences for students. We've found that our six-phase model of learning has been tremendously valuable to educators everywhere as it helps them to turn what often can feel like a disconnected
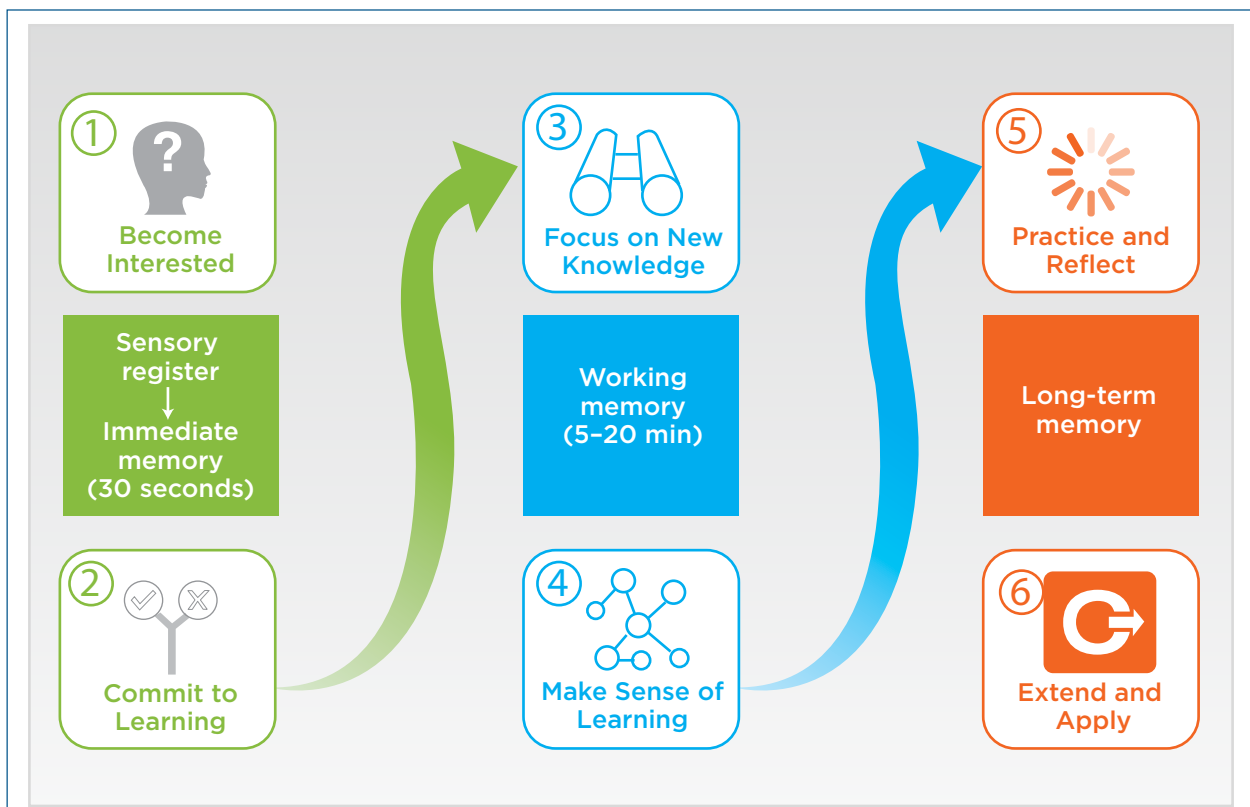
hodgepodge of teaching strategies into powerful learning sequences for students.

We believe this model offers clarity and practical guidance for designing and sequencing adult learning experiences that are highly engaging and effective.

Phase 1: Become interested *(connect PL to teachers' real problems of practice)*

As we describe in our book, *Learning That Sticks* (Goodwin et al., 2020), our brains are hard-wired to ignore most of the stimuli in our environments and only pay attention to that which interests us. Hence, the first phase is that we need to *become interested* in our learning. Decades of cognitive science research and more modern neuroscience studies demonstrate the power of curiosity in both adults and children. When we learn something we're curious about, we're more likely to pay attention, retain new info, and trigger our brains' dopamine reward centers upon learning it.

Research on adult learning reflects this key principle: Adults are more apt to engage in learning if they perceive it will help them address real-life challenges (Knowles et al., 2015). Conversely, they resent being dragged into workshops or training sessions that don't honor their existing expertise and knowledge or their authentic learning needs. And who can blame them? Teachers are busy. No matter how experienced or effective they are, they all have classroom challenges they're seeking to resolve. They may be concerned, for example, about engaging students, supporting struggling learners, or simply wondering how to do everything that's on their plates.

It should be no surprise then that teachers tend to quickly size up whether a particular professional learning session will help them solve their problems of practice. So, instead of *should-ing* on teachers (guilt-tripping them with more stuff they *should* do), effective professional learning starts with teachers' real problems of practice and gives them additional knowledge,

skills, and tools they need to address their classroom challenges.

Phase 1: Ideas and takeaways for PL developers, facilitators, and teachers

We can spark teachers' curiosity by inviting them to first reflect on their biggest classroom challenges. Next, encourage them to identify their own counterfactuals or bright spots to their challenges. For example, if student disengagement is a challenge, when do they see them engaged? What's the difference?

Connect professional learning content to real feedback from teachers about their needs and their students' needs. Consider surveying your PL participants, sharing results, and allowing for discussion. When teachers perceive PL as relevant to their real-life situation, they tend to be more engaged.

Situate professional learning within the context of teachers' school or district goals. Knowing how PL connects to existing initiatives or goals makes it more meaningful for participants.

Phase 2: Commit to learning *(help teachers set personal goals for their learning)*

Deep learning requires tremendous mental effort, which is something our brains prefer not to do. As cognitive scientist Daniel Kahneman (2011) notes, our brains are inherently lazy; they prefer to operate in low-effort mode when possible. To learn anything, we must convince our brains to stay switched on for extended periods of time. Simply stated, we must *commit to learning*.

One of the best ways to do that is to set goals for our learning. This helps us make learning more rewarding and enjoyable because the dopamine reward centers in our brains fire up when we feed our curiosity and achieve goals.

Studies of adult learners show that a key predictor of whether professional learning will result in better practice is whether teachers see it as meeting *their own* goals for professional growth (Garet et al., 2001). As an example, a study of a 14-week, intensive online PL course

that engaged teachers in setting initial goals for learning and sharing progress toward those goals during weekly peer discussion found that six months after completing the course, teachers reported having changed their practices "to a great extent" thanks in large part to their focus on setting and monitoring their own goals for learning (Edinger, 2017).

Phase 2: Ideas and takeaways for PL developers, facilitators, and teachers

At the outset of a PL session, share learning objectives and success criteria with teachers, then invite them to write their own goals for the session. What do they hope to learn and how will it help them address a challenge they hope to solve in their classroom?

Encourage teachers to connect their personal learning goals to the specific changes they want to see in their classrooms. For example, instead of a goal to "learn new strategies for teaching math," make it more specific with a goal like "learn and plan for using new strategies to support my Tier 2 groups in deconstructing and solving word problems."

Provide teachers with a scenario or case study about what's needed to remain committed to learning. Ask teachers to think about what they need in order to stay committed to learning, and then provide time to share out and discuss their anticipated needs.

Phase 3: Focus on new learning
(model new practices with practical classroom examples)

Once we're interested in and committed to learning, we must consciously focus our brains on new learning. It's at this point in the process that direct instruction plays a vital role. Often the most efficient and effective way to learn something is to hear it explained and see it demonstrated. Cognitive scientists have discovered that we retain new information more efficiently and effectively when we can process it visually and verbally (what's known as "dual coding"). In effect, we're all visual learners. We learn best when we see others modeling a new skill and illustrate it with practical examples that make an abstract idea (or strategy) concrete.

Given this, it's not surprising that research on effective professional learning consistently shows that it's more effective when it provides teachers with models and examples for using effective teaching strategies in their own subject areas and with their own students (Garet et al., 2001; Guskey & Yoon, 2009). Conversely, research finds few, if any, positive effects for professional learning that focuses only on general instructional strategies with no connection to teachers' own classrooms (e.g., Cohen & Hill, 1998, and Kennedy, 1998, in Garet et al., 2001). To be effective, professional learning needs to help teachers develop two types of knowledge: 1) practical, how-to skills for applying best practices in their own classrooms, and 2) deeper understanding of how children learn specific content (Garet et al., 2001).

Phase 3: Ideas and takeaways for PL developers, facilitators, and teachers

Provide teachers with multiple subject- and grade-level exemplars of teaching strategies in action.

Share videos of teachers applying the new strategies effectively in their classrooms and invite teachers to reflect on what they see, including how they would adapt the strategy for their own students.

Combine the sharing of practical how-to guidance and examples with a discussion of the *why* that underlies the new practice—for example, how the new practice supports student learning—so that teachers understand how to adapt it for their own students.

Phase 4: Make sense of new learning
(engage teachers in collegial processing of learning)

As we learn new information, we need to pause and process what we're learning—that is, we need to *make sense of new learning*. We learn new knowledge and skills not by tucking it away into neatly organized mental filing cabinets, but rather by connecting it with existing neural networks of thoughts, experiences, and ideas. That means to properly learn something, we need time pause, process, and consolidate our new learning with prior knowledge—often in the

company of others who help us make sense of our learning.

So, it's not surprising that meta-analytic studies find that professional learning is more effective when it engages teachers in active learning opportunities, such as teacher-led discussions, collaborative reviews of student work, and shared planning for implementing new strategies in the classroom (Garet et al., 2001).

Research also shows positive effects for helping teachers to not only understand *what* the new strategies are, but also to explain *why* they work and *how* to adapt them to the needs of their own students (Sailors & Price, 2010). One way to do this is to engage teachers in analyzing videos of their own and others' teaching practices (Roth et al., 2019).

All these strategies, of course, help teachers to make sense of new knowledge and skills, incorporating it into established neural networks. Research shows that professional learning is more effective when it includes an element of "collective participation"—providing teachers with opportunities to process new

learning with colleagues, talking through and planning to apply the strategies with their own students and subject areas, and staying together as a group to sustain use of the practices over time (Garet et al., 2001).

Phase 4: Ideas and takeaways for PL developers, facilitators, and teachers

At regular (e.g., 20-minute) intervals during a workshop, provide participants with opportunities to pause and process what they're learning—both as individuals through silent written reflection as well as through structured group activities, or a combination of both.

Avoid using think-pair-share ad nauseam. Instead, engage participants in wide variety of group activities, such as jigsaws, reciprocal teaching, gallery walks, and "give one, get one" exercises.

When planning professional learning, think of Phases 3 and 4 as a cycle in which participants learn new information and have time to process and reflect on that new learning before learning the next chunk of information. A key feature in this design is that as educators make sense of their new learning, they're actively making connections between new learning, previous learning in the same session, and their own experience.

DO WORKSHOPS WORK?

The short answer is yes. In fact, Phases 3 and 4 of this model can be addressed through well-designed workshops. In a review of nine studies of professional learning that met What Works Clearinghouse criteria for credible evidence, Guskey and Yoon (2009) note that, "Workshops are not the poster child of ineffective practice that they are often made out to be" (p. 496). Rather, teacher workshops were found to play a vital role in teacher learning, especially workshops that "focused on the implementation of research-based instructional practices, involved active-learning experiences for participants, and provided teachers with opportunities to adapt the practices to their unique classrooms" (p. 496).

That part about research-based practices is key. Contrary to popular perception that teacher professional learning ought to be created and delivered by teachers themselves based on their own lived expertise (e.g., so-called Ed Camps or Unconferences), Guskey & Yoon (2009) found that such approaches are seldom effective because they often perpetuate inferior practices. The professional learning that actually made improvements in student learning, they said, "focused principally on ideas gained through the involvement of outside experts" (Guskey & Yoon, 2009, p. 496).

Phase 5: Practice and reflect *(support learning with job-embedded assistance and follow up)*

Cognitive science is clear: the only way to truly embed new knowledge and skills into our long-term memory is repetition, repetition, repetition. Each time we repeat or rehearse a new bit of learning in our brains, we strengthen the neural connections that form and retain that learning in our minds. Over time, our brains become better able to activate those neural networks in unison so that recalling the information becomes easier. Therein lies the shortcoming of much maligned "spray and pray" PD sessions: Teachers may learn something in the moment, but they seldom think about or practice it afterward in their classrooms. As a result, it quickly fades from memory.

Years ago, Mary Budd Rowe observed that immediately after instructing teachers in the strategy of using "wait time" (pausing for a few seconds after asking students questions before calling on them), the teachers were using the strategy in their classrooms. But in a matter of weeks, their use of wait time began to fade and

eventually disappeared as they returned to old habits of peppering students with rapid-fire questions and no wait time. Those declines were reversed, though, when coaches regularly observed teachers in the classroom and helped them stick with the new practice long enough for it to become a new habit.

A review of 13 scientific studies that closely examined the effects of coaching following professional learning found coaching to be critical to the uptake of new practices (Kretlow & Bartholomew, 2010). Without coaching, teachers applied very little of what they learned during workshops in their classrooms. So, it's not surprising that Guskey and Yoon's review of effective professional learning programs found positive effects for providing teachers with "just-in-time, job-embedded assistance as they struggle to adapt new curricula and new instructional practices to their unique classroom contexts" (2009, p. 497). Indeed, "virtually all" of the examples of effective professional learning identified in rigorous research "included significant amounts of structured and sustained follow-up after main professional development activities" (p. 497).

Phase 5: Ideas and takeaways for PL developers, facilitators, and teachers

As post-session or inter-session activities, encourage teachers to spend 4-6 weeks implementing a new strategy in their classroom and reflecting on the changes they see in student learning or behavior.

Just as with students, provide teachers with ongoing coaching and feedback from expert practitioners during this period, continually inviting them to discuss what's going well and what could be improved.

Keep new learning at the forefront by providing time during faculty meetings or collaborative team time to discuss what's working and how practices are being used.

Create a staff newsletter, blog, podcast, etc. aimed at sharing strategies that help educators practice and reflect on their new learning.

Phase 6: Extend and apply *(expand learning via peer-supported communities of practice)*

Ultimately, successful professional learning goes beyond merely ensuring teachers *implement* a new practice effectively. Instead, it helps them to understand the new teaching practice so deeply that they can adapt it to the needs of their own students. We might think of this level of knowledge as teacher *expertise*. Decades of research shows that the key to expertise in any field—the difference between experts and novices—is that experts have well-developed and refined mental models that allow them to diagnose challenges and retrieve appropriate strategies for solving them.

IS ONLINE PROFESSIONAL LEARNING EFFECTIVE?

Studies have found equally positive effects for in-person and online professional learning (Fishman et al., 2018)—with significant efficiencies for online learning, which often require considerably fewer contact hours for the same effects (20 vs. 48 hours).

Effective online professional learning is not, however, a "quick hit" or one-shot course. It's an intensive and extended professional learning experience.

One of the best researched examples examined the e-Learning for Educators Initiative, which provided teachers in 10 states with ongoing, facilitated, and asynchronous online PD. Over the course of a school year, teachers engaged in 100-plus hours of job-embedded professional learning delivered in digestible chunks and supported with a robust collection of classroom videos and tools for applying best practices. The study found positive effects on teacher behaviors and student achievement (O'Dwyer et al., 2010).

Notably, across multiple studies, a key element of effective online professional learning is the presence of coaching and mentoring (Lay et al., 2020), for example when expert coaches visit teachers' classrooms virtually and engage in regular online conversations with them.

In short, simply transferring bad "spray and pray" PD into digital formats reflects the "worst of both worlds"—one-shot perfunctory training with few opportunities for ongoing collaboration or application.

But well-designed online learning can be *even more* efficient and effective than in-person learning when it reflects the six phases of brain-based professional learning described here.

How do we develop expert mental models? Often, it's by working with others to continually articulate and refine our thinking—a process that David Hopkins, a former McREL senior fellow and senior education advisor in the U.K. government, refers to as developing "precision without prescription."

A review of 73 empirical studies of effective professional learning programs (Lay et al., 2020) found that embedding teacher learning into communities of practice (groups of teachers engaged in dialogue and peer-coaching around professional learning) was essential in improving their practice. And as shown in the table below, Joyce and Showers observed years ago (2002) that without peer coaching, very little of what teachers learn in traditional PD sessions transfers into classroom practice.

Two key points are worth making here. The first is that peer coaching refers to small groups of 3–4 teachers working together to observe one another's classrooms, offer collegial

encouragement to one another, and provide one another with critical friend feedback.

The second point is that to be effective, peer coaching must be well-structured and guided. A small experiment with teachers in Kentucky schools (Murray, Ma, & Mazur, 2009) illustrated how peer coaching, if not structured properly, can come off the rails. Researchers observed teachers' peer coaching conversations and found that they were mostly positive and supportive, but lacked depth—that is, they offered little critique or guidance. They tended to flit from one topic to the next (covering as many as 18 topics in 19 minutes), without delving deeply into any single teaching strategy. "Overall," the researchers observed, "peer partners did not challenge or question one another's classroom practices" (p. 209).

Conversely, a small qualitative study in Canada (Jao, 2013) found that giving teachers *guiding questions* for their collaborative conversations and *protocols* for observing classrooms helped them to be better critical friends to one another.

Components	Knowledge	Skill	Transfer
Study of theory	10%	5%	0%
Demonstration	30%	20%	0%
Practice	60%	60%	5%
Peer coaching	95%	95%	95%

Source: Joyce, B., & Showers, B. (2002). *Student achievement through staff development (3rd ed.). ASCD*

Before being observed, for example, teachers shared what practices they were working on and invited feedback by answering these questions:

- What are you planning to do today in the classroom?
- What did you do in the past?
- What would you like me to observe?

While observing others' classrooms, peer groups used rubrics to define exemplary practices for the strategy at hand. Afterward, observed teachers initiated coaching conversations by sharing self-reflections on the lesson and then invited peers to share observations (not judgments) about what they'd seen. The conversations ended with observed teachers identifying what they planned to do differently next time. Teachers reported that these structures smoothed the edges off what otherwise might have been a prickly process and made the coaching sessions more productive. In short, structures like rubrics, guiding questions, and classroom look-fors are key to ensuring peer coaching is effective in changing practice.

Phase 6: Ideas and takeaways for PL developers, facilitators, and teachers

Provide teachers with (or engage them in co-creating) rubrics, innovation configuration maps, or pathways to clarify and reflect on what expert use of new teaching strategies looks like.

Provide teachers with feedback prompts and structured protocols for engaging in peer-coaching conversations.
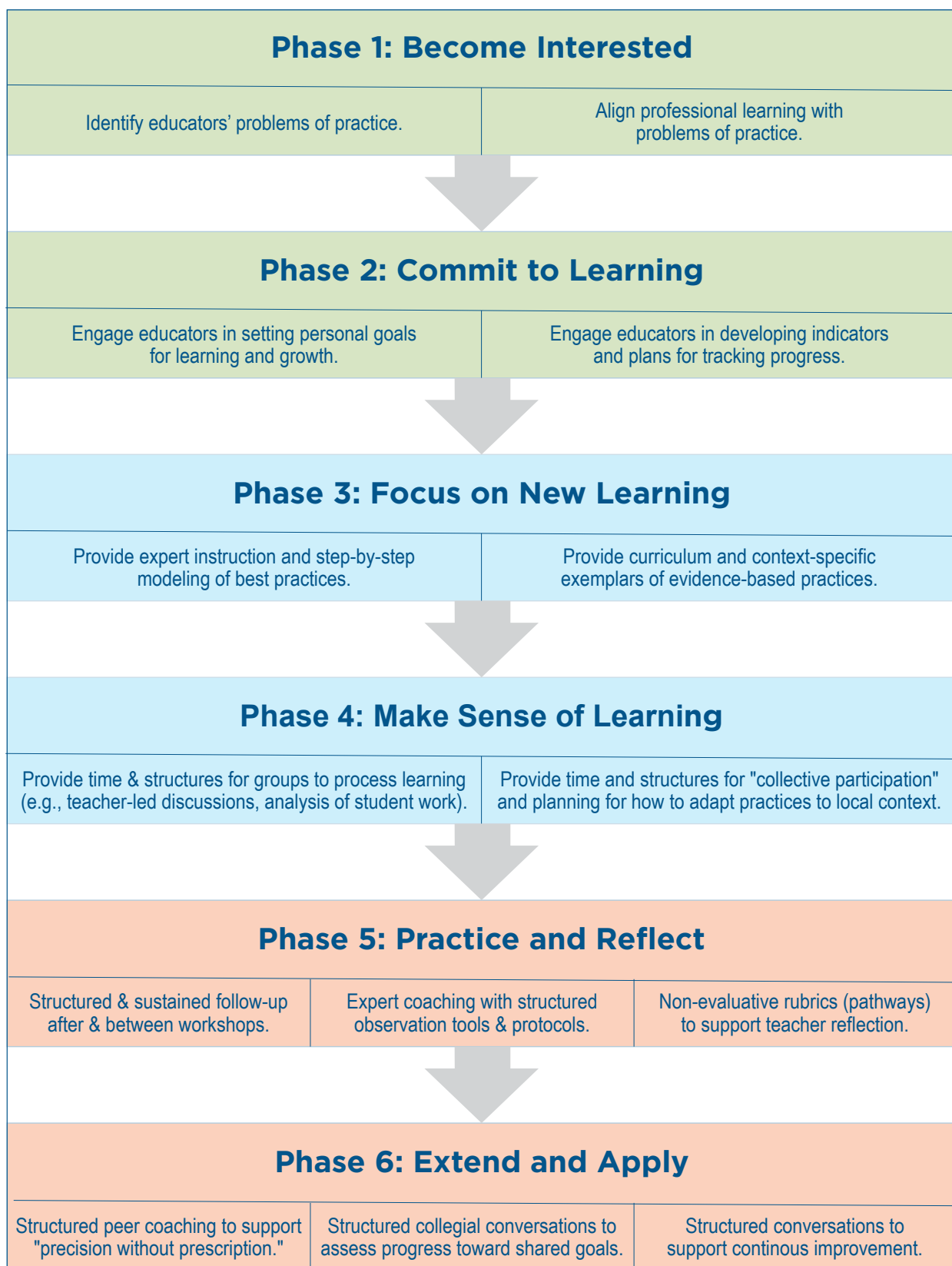
Provide time for teachers to observe one another's classrooms and then engage in structured peer coaching sessions with one teacher serving as the coach, another as the facilitator for the conversation, and a third receiving feedback from the coach.

Rotate these roles on a regular basis (e.g., weekly or monthly) so that every teacher in the triad participates in all three roles.

McREL's brain-based model of professional learning

The following infographic summaries these findings into a simple, yet rigorously researched brain-based model of professional learning.

Phase 1: Become Interested

Identify educators' problems of practice.	Align professional learning with problems of practice.

Phase 2: Commit to Learning

Engage educators in setting personal goals for learning and growth.	Engage educators in developing indicators and plans for tracking progress.

Phase 3: Focus on New Learning

Provide expert instruction and step-by-step modeling of best practices.	Provide curriculum and context-specific exemplars of evidence-based practices.

Phase 4: Make Sense of Learning

Provide time & structures for groups to process learning (e.g., teacher-led discussions, analysis of student work).	Provide time and structures for "collective participation" and planning for how to adapt practices to local context.

Phase 5: Practice and Reflect

Structured & sustained follow-up after & between workshops.	Expert coaching with structured observation tools & protocols.	Non-evaluative rubrics (pathways) to support teacher reflection.

Phase 6: Extend and Apply

Structured peer coaching to support "precision without prescription."	Structured collegial conversations to assess progress toward shared goals.	Structured conversations to support continous improvement.

How much professional learning is enough?

A great deal of research points to the duration and frequency of professional learning being critical to changing teacher practice (e.g., Garet et al., 2001; Blank & de las Alas, 2009). The interventions that showed the most positive effects in Guskey and Yoon's review of scientific studies included 14 or more contact hours typically in brief (1–3 hour) professional learning sessions and/or follow-up conferences spread over a period of weeks. Equally important, the three studies of professional learning programs with the least number of hours (5–14) showed no effects (Yoon et al., 2007).

It's worth noting, though, that many of the reviewed interventions were designed to increase a broad array of teacher knowledge and skills, such as the science of reading or pedagogical content knowledge in mathematics. So, it's likely that for more targeted teacher development, fewer contact hours may suffice to change teacher practice. For example, in a randomized control trial involving 20 teachers and 190 students (Duong et al., 2019), teachers were taught to use the EMR method to 1) *Establish* positive relationships with students by "banking time" with them, 2) *Maintain* relationships through positive feedback, and 3) *Restore* damaged relationships through intentional dialogue. Just 13 weeks after an intensive yet brief 3-hour workshop on the method, teachers saw significant improvements in student engagement and behavior.

Effective PL: An investment that pays dividends

U.S. schools likely spend billions annually on teacher professional development (EdTech Evidence Exchange, 2021). Unfortunately, much of it remains a dull waste of time for many teachers. Worse, it doesn't have much effect on students or teachers.

Schools and districts can get more out of that investment by making the intentional decision to stop delivering PD of the past and instead thoughtfully creating professional learning systems, sessions, and supports that provide teachers with the very same kind of rich, relevant, engaging, and effective learning experiences that we want for our students. ◆

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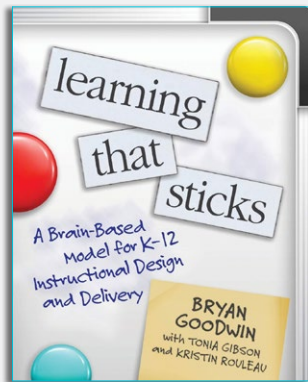
Learning That Sticks: A Brain-Based Model for K—12 Instructional Design and Delivery

Unpack the cognitive science behind research-supported learning strategies and learn to design and sequence your units and lessons into experiences that will challenge, inspire, and engage your students. As a result, you'll learn to teach with more intentionality—understanding not just *what* to do but also *when* and *why* to do it.
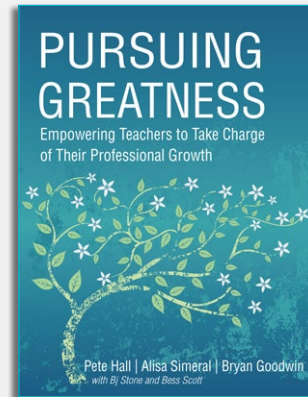
Pursuing Greatness: Empowering Teachers to Take Charge of Their Professional Growth

Presenting a purposeful self-reflection process for teachers, this book guides educators on a continuous improvement journey to create more positive, engaging learning environments, prompt students to commit to their learning, motivate students with productive feedback, and more.

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