EVERYDAY PROBLEM-BASED LEARNING

Quick Projects to Build Problem-Solving Fluency

Introduction

A book that focuses on the everyday classroom application of inquiry-based learning cannot provide all the answers, but it can provide a pathway for teachers to incorporate the essential elements of inquiry-based learning within the parameters of a single class period or an individual lesson.

First, a question for the reader: What is inquiry-based instruction? We use this term throughout the book to refer to any instruction that has the following elements: an essential or a *driving question*, *open-ended solutions*, and *learning challenges* that students encounter as they try to solve complex problems.

Traditional models of instruction assume that students must master content before applying what they've learned to solve a problem. Problem-based learning (PBL) reverses that order and assumes that students will master content while solving a meaningful problem. The problem to be solved should be engaging, and at the same time, it should address the curricular issues required by the curriculum.

The problem provides the purpose for learning the content, and the content becomes the vehicle that carries valued life skills. Both *content* and *process* are on equal ground as students learn such rigorous skills as

thinking, organizing, collaborating, and communicating across various disciplinary areas.

A second question for the reader: Why pursue inquiry-based instruction if students might learn less content than when taught in a conventional way? We contend that any content that students address is readily available with any internet search engine. Any and all content can be "Googled"; thus, it may not have the same urgency of mastery as the element of inquiry-based instruction that teaches the most relevant processing skills for the deep understanding needed for complex problem solving. While the content is often the focus of inspiration, igniting student motivation, and, as stated earlier, an explicit focus on the process skills of inquiry learning must also take center stage, because this model puts the responsibility for learning squarely on students' shoulders. They must know how to generate, organize, analyze, infer, and draw conclusions well, if they are to become experts in the problem-based learning curriculum of 21st century learning and living.

Interlacing Two Sets of Ideas

This book begins by connecting the work of two highly respected authors: Daniel Coyle (2009), author of *The Talent Code,* and David Perkins (2009), author of *Making Learning Whole*. Let's look at how lacing their ideas together through problem-based learning models can serve the inquiry process.

Coyle and Talent

In *The Talent Code*, Coyle studied elite athletes, artists, and performers from all over the globe. As a result, he developed a theory he called *the talent code* to describe what he had learned about their remarkable achievements, from a young Suzuki violinist in Japan to champion women golfers in Korea. Three elements appeared in every case of outstanding performance: deep practice, ignition, and master coaching.

Deep practice. Ericsson, Krampe, and Tesch-Romer (1993) first described the essential role of deep practice, which Malcolm Gladwell (2008) subsequently popularized as the 10,000 Hour Rule—that is, that it takes 10,000 hours of deliberate practice to become an expert. Drawing from cognitive science, the message is reach, repeat, and struggle to maximize "reachfulness." Frequency, intensity, and brevity in practicing new skills are the game-changers in the role of practice. And here's why this is so important: *These behaviors generate the white matter, or myelin, that wraps around the axons in brain cells to strengthen learning pathways.* Teachers would be wise to replace the longer skill-and-drill kind of exercises with more frequent, more intense, and briefer intervals of deep or deliberate practice.

Ignition. A jolt, a spark, an incident ignites the fire. But what lightning bolt jolts the learner, ignites his or her desire to know, and sets the whole thing in motion? Let's look at Csikszentmihalyi's (1990) groundbreaking concept of *flow*, a state in which we are so involved in an activity that nothing else seems to matter. Time flows by unnoticed. When we're in a state of flow, we think, "This is what we feel good doing, and we seem to be good at it. We want to do more of this. We think this is who we are." Looking at it another way, it's like capturing the magic of that natural desire to achieve a "personal best," which Robyn Jackson (2009) alludes to in an intriguing question: How do teachers inspire students in ways that ensure that "teachers never work harder than their students" and that students are motivated to take the lead in their own learning?

Master coaching. *Talent whisperers*—those wonderful coaches that Coyle describes who foster learning in their students—make extraordinary personal connections with the learners they work with. They're also extraordinary themselves. Because of this, they provide keys that are crucial to the learner's development.

Master coaching is a rich vein to mine all around. There's Feuerstein's (1985) seminal work, *Instrumental Enrichment*, on *cognitive modifiability*,

which refers not only to the remediation of various behaviors and skills, but also to structural changes that may affect a person's cognitive development. There's Showers, Joyce, and Bennett's (1987) review of 30 years of research on effective coaching, as well as Perkins's (2014) more recent discussion of *lifeworthy learning* and what we need to do to inspire learners to learn. Finally, Salomon and Perkins (1989) and Fogarty and Pete (2004) offer rich perspectives on transfer of learning.

Perkins and Wholeness

Co-founder with Howard Gardner of Project Zero at Harvard University, David Perkins has been working in the area of cognitive learning with a focus on thinking; metacognition; deep understanding; learning for wholeness; and, most particularly, learning for transfer.

As Perkins noted in an interview (Hough, 2009), he wasn't especially good at baseball as a child. In fact, he says he didn't show much talent for sports at all. Yet it was America's national pastime that Perkins turned to when he started writing *Making Learning Whole*. Although the results of playing baseball weren't great for him, he says this about the process: "From the beginning, I built up a feel for the whole game. I knew what hitting the ball or missing the ball got you. I knew about scoring runs and keeping score. I knew what I had to do to do well, even though I only pulled it off part of the time" (p. 2). And then, the epiphany: "I saw how it fit together" (p. 2). Why not apply this same logic to teaching, Perkins thought, especially in subject areas like math and history, where students often struggle to make connections?

Two Plagues of Current Instruction

We educators always face the challenge of helping our students approach complex skills and ideas. So what do we usually do? According to Perkins,

the two most familiar instructional strategies are "learning by elements" and "learning about."

In the "elements" approach, we break down the topic or skill into elements and teach them separately, putting off the whole game until later—often much later. So students end up practicing meaningless pieces to score well on quizzes without developing a sense of the whole game. In math, for example, they might be able to do the computations, but they don't know what operations to use and when to use them. Perkins refers to this teaching approach as *elementitis*. We teach adverbs as an element of parts of speech. We define, describe, and practice finding adverbs and even writing adverbs as a vital part of our speech patterns. Yet we often neglect to focus explicitly on the intentional and purposeful use of adverbial phrases in the students' subsequent writing assignments. When adverbs are not the element of focus, the application piece seems to sink into the background as an expectation but with no real accountability for using adverbs embedded in the wholeness of writing.

In the "learning about" approach, instead of teaching students *how* to do the thing in question, we teach *about* it. For instance, we teach information about key science concepts rather than teaching students how to look at and think about the world *using* those concepts, which supposedly comes later. But, again, the information tends to be meaningless without a context, and often "later" never happens. Perkins calls this approach *aboutitis*.

A good example of *aboutitis* is in the area of literacy. Teachers talk *about* "comprehension" and how important it is for students to *comprehend* and *understand* what they have read. In essence, they're telling students to read and make sense of the reading—that *that* is what comprehension is all about. Yet what's missing in these scenarios are the actual micro-skills that comprise deep understanding and comprehension. When teachers dig deeper into comprehension, as Keene and Zimmermann (1997) did in *Mosaic of Thought,* they find a variety of necessary skills: those of vocabulary building, fluency and flow in reading, visualizing what is described,

asking questions of purpose and meaning during the reading, reflecting along the way, knowing immediately when one has lost contact with the text, and knowing enough to employ a recovery strategy. That's what comprehension is when analyzed and approached cognitively.

According to Perkins, *elementitis* and *aboutitis* are devil's bargains. They make learning superficially easier today, but young learners find them dull and fail to develop the active understandings we really want them to acquire.

An Overview of the Book

There are seven chapters in the book. Each chapter tackles one thinking skill—*develop*, *analyze*, *reason*, *understand*, *solve*, *apply*, and *evaluate*—and each skill parallels one of the seven steps in the everyday, problem-based learning model: Develop questions, launch the scenario, gather information, organize information, create evidence, present findings, and assess learning (see Figure I.1). Not all inquiry-based learning must have seven steps or even these seven steps. However, this process, which we've developed over the years, has proven quite helpful in K–12 classrooms. We expect that readers who truly understand that inquiry-based learning is a personal journey may modify the number of steps or the order of those steps or even alter the actual names of the steps identified in this text.

Chapter 1, Develop Questions, is about the integral part that essential or driving questions play in inquiry learning. Also included is a practical way to teach, support, and facilitate creativity in the development of these questions in the classroom. Chapter 2, Launch Scenario, discusses the power of learning from a specific point of view, a frequently overlooked component of inquiry-based learning. It is referred to as the stakeholder role. Chapter 3, Gather Information, looks at searching, researching, and collecting necessary data to find alternatives and solve a problem. In Chapter 4, Organize Information, we address how to manage, prioritize, and synthesize large

Figure I.1 | **Thinking Skills by Chapter**

Chapter	Thinking Skill
1: Develop Questions	Develop
2: Launch Scenario	Analyze
3: Gather Information	Reason
4: Organize Information	Understand
5: Create Evidence	Solve
6: Present Findings	Apply
7: Assess Learning	Evaluate

amounts of data. Chapter 5, Create Evidence, looks at how students can best create evidence of learning to show their findings, and Chapter 6, Present Findings, deals with how to best present that evidence in a compelling and persuasive way. The last chapter, Chapter 7, Assess Learning, discusses how to evaluate the final product and reflect on the processes used.

We begin each chapter by asking readers to keep in mind the two overarching ideas: David Perkins's (2009) "whole game" approach from *Making Learning Whole*—that is, that learning is most natural and enduring when it takes place within a *comprehensive context*—and Daniel Coyle's (2009) focus on *deliberate practice* in *The Talent Code*—that is, using multiple reflective iterations of a skill as the best way to develop mastery. The final piece in each chapter is a complete, problem-based lesson example that includes all seven steps of the problem-based learning model to guide teachers through the process. This is featured to afford teachers a step-by-step lesson to try, with each lesson focused on the details of one particular step.

These are everyday problem-based learning lessons, which we call "PBL in a Nutshell." They are designed to be completed in a single classroom period and to challenge students, or teachers in a professional development

setting, to make decisions, solve problems, think critically, create a product, and present that product—all in 21 minutes. In addition, each lesson is paced for time allotments to model how the time limit is possible. Although students and teachers alike may be skeptical about the brief time limits and their abilities to accomplish the goal, they soon become enthused with their successes and energized for the next activity. Each mini-PBL lesson encapsulates key ideas from *The Talent Code* and *Making Learning Whole*.

Finally, in an afterword, we suggest why teachers must heed the sense of urgency and incorporate the dearly needed essential organizing, thinking, and decision-making elements of inquiry-based learning into their teaching practices.