



# Building CI habits through practice

Lean is about a fundamental change in thinking.  
How do we teach our brains to make the change?

BY JEFFREY K. LIKER

Lean training seemed fairly straightforward early in the 1990s, when companies started to get a glimpse of the famed Toyota Production System (TPS). With an intensive, short training program and the help of some experienced consultants, it was possible to implement a rudimentary pull system, set up some cells and write out standard work. Unfortunately, these systems that seemed revolutionary in the moment then quickly degraded back toward their original state, for some mysterious reason.

We got a clue about the problem with the tools approach when Jim Womack and Dan Jones called their 1996 book “Lean Thinking,” instead of “Lean Methodology.” This was not a surprise to experienced students of TPS, who knew that from the early days at Toyota, TPS was rooted in a scientific way of thinking and working. Taiichi Ohno would drill this into his students, beginning with standing in a circle at the

gemba and describing what they see for an entire day. Grasp the actual condition! The power of deep, fact- and data-based observation was a prelude to an iterative journey of learning by doing on the shop floor, with Ohno correcting and even ridiculing his students.


Ohno would give brief, terse feedback and ask questions challenging the student to think, but would not give answers. He would provide a seemingly impossible challenge, ask the students to get started, and then provide sometimes harsh feedback along the way. The students were highly motivated to impress Ohno, which was almost impossible to do, by working hard

and thinking hard. He guided them through a process of repeated experimentation and learning, which we now call Plan-Do-Check-Act (PDCA). He called this “scientific thinking.” Though it was sometimes uncomfortable, the result was that people developed a certain way of thinking over years of practice. Ohno’s students became among the best lean thinkers, which meant they had an obligation to teach others.

Ohno and his students gave us an effective model for developing a new mode of thinking, which actually is centuries old. We have a pretty good idea of what works. It involves learning at the gemba and working on real problems,

**“A tendency to act only becomes effectively ingrained in us in proportion to the uninterrupted frequency with which the actions actually occur, and the brain ‘grows’ to their use.”**

WILLIAM JAMES, AUTHOR OF “HABIT,” 1890



course-corrected by the thoughtful feedback of seasoned coaches. It is an everyday thing, not a once in a while thing. We also have at least a couple of decades of experience with what does not work. Sending your team into a classroom or workshop for a few days or weeks to absorb large quantities of information and then draw on it out of memory whenever it is needed does not work very well. Seminars can provide basic information and awareness, but for changing mindset and behavior habits, the Ohno type of teaching is more consistent with what we know from brain science. The evidence is overwhelming that real-practice-based teaching is far superior to classroom instruction.

### **Our brains and lean thinking**

Now that we understand lean is about a fundamental change of thinking, what do we do? There is a serious implementation problem — that mysterious reason for decay — that can be explained with a single word: habit. As William James noted more than 100 years ago,<sup>1</sup> habits are a basic part of our brain physiology and psychology, and they get harder and harder to change as we get older. There are habits for performing basic

tasks, such as writing with our dominant hand or tying shoelaces a certain way, and there are habits in ways of thinking. Unfortunately, the default for how we think about problems generally favors quickly jumping to conclusions, not scientific thinking.

In his 2011 book, “Thinking, Fast and Slow,” Daniel Kahneman summarizes decades of cognitive psychology research through the lens of a simple dichotomy. Our brain contains two systems: one that

makes rapid decisions based on limited information (fast thinking), and one that carefully sifts through the data to derive reasoned conclusions (slow thinking). This is more a metaphor than reality, but thinking of the brain as being composed of two systems is useful. There is evidence that our brain rewards us for fast thinking by activating pleasure centers and punishes us for slow thinking by stimulating the pain centers. Kahneman even proposes a “law of least mental effort.”

Forty thousand years ago, we fought the elements, fought animals, fought other people and tried to feed our young. In problematic situations, quick response was often a key to survival, not deep contemplation and carefully reasoned decisions. Our ancestors with brains designed to encourage fast thinking with dopamine and other positive stimulants won and had children who dominated the earth. Slow, laborious thinking took far more energy and attention away from our daily challenges to survive, and therefore was accompanied by pain signals. Thousands of years later, the scientific thinking Ohno was trying to teach felt slow and was energy intensive, at first, which was why he had to use tough love to motivate people day in and day out to work through their natural, but flawed, predispositions.

In sum, it is more natural to jump to conclusions than to think slowly. We are exposed to limited amounts of information, yet we tend to quickly draw strong inferences. Our brains “fill in the blanks” and we assume things we do not actually know. The brain is naturally uncomfortable with uncertainty, which in primitive days meant risk of death, and prefers to quickly find certainty. Nobel prize winner Herbert Simon observes that we generally select the first alternative that comes along that seems like a good and often safe choice (called “satisficing”), without investigating further.<sup>2</sup>

Fortunately, we have the power to change our habits. Neuroplasticity, even in old age, is real. In the late 1800s, William James argued the brain was plastic and could be molded, late in our lives, too. He explained

that “plasticity ... in the wide sense of the word, means the possession of a structure weak enough to yield to an influence, but strong enough not to yield all at once.”<sup>3</sup> William James’ insights have been confirmed by modern brain scanning technologies where we can actually observe neurons lighting up and making new connections as we learn. It’s physiological.

### Practice is the countermeasure to habits you want to change

One thing that has become clear is that changing mindset is more about forging new neural pathways by practicing a new way, which over time replaces the old pathways, than just trying to erase old ways of thinking. Want to lose weight? Practice new patterns of eating and exercise. It’s the same with lean thinking.

This raises the bar on educating people to think lean, because a workshop or course alone will not change thinking to create new habits. We cannot attack the subroutines etched in the hidden parts of our brain with information and reasoning alone. Short practice sessions at the gemba with rapid feedback, every day for several months, eclipse what we can learn from a short course. Of course, this assumes the student has the discipline to practice and the teacher is around often enough to encourage practice and give rapid feedback.

### What about practicing scientific thinking?

There are many practice guides for learning how to play music, cook, paint, play a sport, play chess and countless other pursuits, but surprisingly few for the important skill of scientific thinking. Recently, higher education is being challenged in this regard by professors informed by neuroscience. One is Nobel Prize winner Carl Wieman, whose goal is to teach students how to reason through problems like a physicist. To learn how to solve real problems, they need to do it repeatedly, with corrective feedback. In Wieman’s approach, students are expected to do prework on their own time, and then much of class time consists of teams of students working to

solve problems with the teacher providing specific, targeted feedback. He has ample data from various types of tests to demonstrate his approach is more effective than traditional lecture training.<sup>4</sup> He has even brought the data to top university leaders to try to sell them on practice-based learning, with limited success. It seems the habits of classroom lecturing are deeply ingrained.

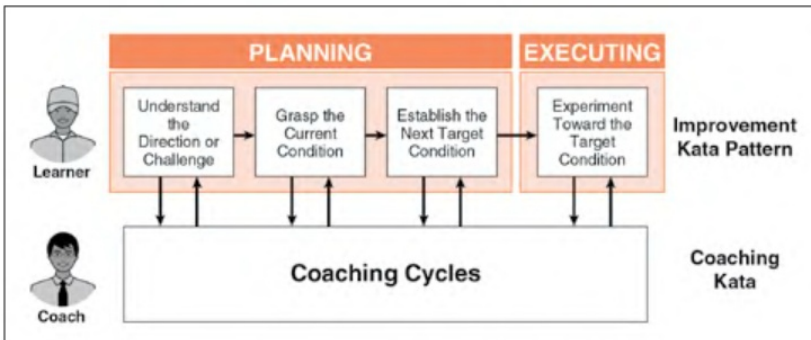
What would be the lean analogy to Wieman’s approach? First, we would need a clearly defined model of lean or scientific thinking, broken into small components or steps that could be taught one by one. Second, we would need something for the students to practice to learn to think this way. Finally, we would need a coach who has expertise in scientific thinking and providing corrective feedback to students. On the last point, Wieman notes that high school science teachers who learned from lectures often have not mastered the skills to solve real-world problems and therefore are not equipped to coach students through experiential learning. We would need coaches who first learned to do it themselves — to solve real workplace problems using a scientific approach.

### Enter Toyota Kata

That approach is precisely what the Improvement Kata is designed to do. Kata are small routines that a learner can practice to a level of mastery. The Improvement Kata is designed specifically to start the student down the path of scientific thinking.<sup>5</sup>

1. It starts with a model, or pattern, of practical scientific thinking, in four steps.
2. Practice routines have been developed for each step. They’re called “Starter Kata.”
3. There is a complementary Coaching Kata, to help the coach practice sensing how the learner is thinking and giving effective corrective feedback, in daily interactions called “coaching cycles.”

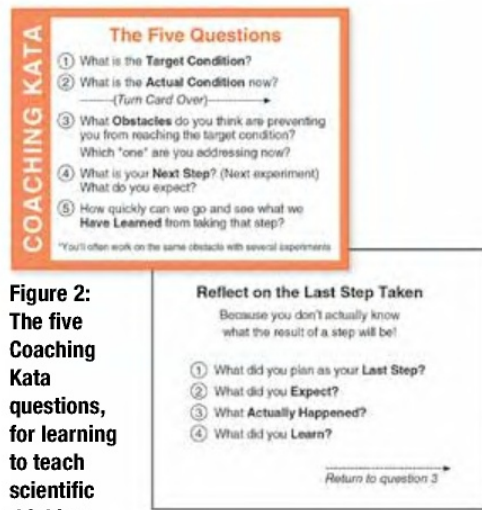
The Starter Kata for the Improvement Kata pattern are stepping-stones for acquiring



**Figure 1: The practice routines of the Improvement Kata and the Coaching Kata are starter drills for developing a scientific way of thinking.** (Illustration from “Toyota Kata Culture,” NY: McGraw Hill, 2017.)

new habits of thinking and acting. The goal is to internalize each Starter Kata’s fundamental pattern so you can then build on and adapt that pattern under a variety of circumstances as a reflex, with little thought or hesitation. It’s like a beginner musician practicing a musical scale. You don’t stick with playing a musical scale forever, but go beyond it by building on what you learned from practicing it. The next learner who comes along begins with the same Starter Kata.

The Improvement Kata pattern starts with a challenge, a direction for improvement that matters to the organization (see Figure 1). This leads to study of the current condition at the learner’s particular gemba. Often, this leads lean practitioners to immediately list problems that need to be solved and develop a list of countermeasures assigned to different people, but that is not scientific thinking. Instead, the Improvement Kata has the learner first establish a next, closer in “target condition” for their focus process, in the direction of the challenge, with an achieve-by date between one week and one month in the future. Then the learner starts identifying obstacles to that target condition and begins to experiment against those obstacles, one by one, to iteratively move toward that target condition.



**Figure 2: The five Coaching Kata questions, for learning to teach scientific thinking.**

(Illustration from “Toyota Kata Culture,” NY: McGraw Hill, 2017.)

After reaching one target condition, the learner reflects and establishes the next target condition. In other words, the pathway to the challenge is not exactly mapped out in advance, nor is a list of countermeasures tested all at once. The coach is encouraging the learner to rapidly test their ideas, and find the path through learning.

In parallel to the learner’s practice of the Improvement Kata pattern, a set of Coaching Kata questions provides a Starter Kata for the coach (see Figure 2). These questions

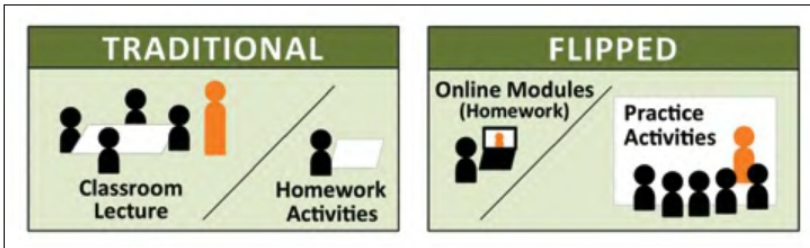
are the main headings for the daily coaching cycles between the coach and the learner, and prompts to help the coach to see how the learner is thinking, so the coach can provide appropriate, situational feedback based on listening to the learner.

Practicing Starter Kata has been used for centuries as a way of preserving effective skillsets, transmitting them from person to person and building effective teamwork. Having a set of Starter Kata is particularly useful when you want to create a shared way of thinking and acting, a deliberate culture, among a group of people, because everyone begins with practicing the same fundamentals.<sup>6</sup> By initially restricting practice improvisation — just like Taiichi Ohno did — the learner acquires a sense for the essence, which can then be applied in increasingly diverse situations. Ultimately, then, the Starter Kata are not the important thing. What are important are the skills and mindset that practicing them imparts, which you can then build upon.

### Educators are flipping their classrooms

A practical approach that is rapidly gaining favor in the education world gives us more clues about how we can educate people to think lean. It revolves around something called “flipping the classroom.” There is a place for conventional classroom or online learning, but it is not to directly develop new habits and skills. It’s to prepare for practice with a coach, which is what develops the skills.

What a traditional lecture attempts to do is impart concepts and methods from the teacher’s brain to the student’s brain through presentations, which are then applied through homework assignments outside of class (see Figure 3). There is a batch of concepts in class, followed by a batch of homework that the student then does on their own. Though newer, many online courses still follow that same old pattern, simply substituting an online lecture followed by homework. Unfortunately, as we are seeing, changing how we think — our habits — happens more through spaced practice with real-time coaching input.



**Figure 3: Traditional lecture teaching versus flipped classroom.**

Today, more and more educators are turning that old, traditional pattern around, and getting better results. In flipping the classroom, the teacher has students get the “lecture” information on their own time before class, often through online video modules of recorded lecture segments and examples. The real skill development then happens in the classroom, through problem-solving practice (which, in the old approach, a student struggled with at home alone). For example, this might involve students doing activities in small groups with the teacher roaming the classroom and providing feedback group by group. This can then lead to a class-wide reflection, and then it’s on to the next concept. This can be followed by more problem-solving homework, though increasingly, teachers, informed by neuroscience, do not give that kind of homework at all and prefer the students to rest after class, work on a sport or hobby they are passionate about, and watch the next online lecture module in preparation for the next class period.<sup>7</sup>

Doesn’t this sound like a better way to teach lean thinking? Carl Weiman explains how he flips the classroom:

“What we know about learning from cognitive psychology is that people learn by practicing, with feedback to tell them what they’re doing right and wrong and how to get better. In this case, that means they need to practice thinking like a scientist in the field. They should do background reading that gives basic information before class and then in class they’re working through carefully designed problems that give them practice at a particular sort of scientific thinking, whether it’s how physicists think

about forces in motion or biologists think about cells and how they repair themselves, and so on. This way, they get much more targeted feedback from the instructor, who can realize they’re confused about some basic point and can guide them much more directly. In this way, students spend all of their time in class being very actively involved, using their brains strenuously. They would also have homework problems that build on what they’ve done in class so they can practice more extensively.”<sup>8</sup>

### Online Kata basics course to help you flip your classroom and prepare learners for practice

Recently, working with Jim Franz, we developed an online Improvement Kata (IK)/Coaching Kata (CK) course with this precise purpose in mind — prework for a class or other session to practice scientific thinking. In other words, flipping the classroom. It’s called the “Online Improvement Kata & Coaching Kata Basics Course” and is a compact, interactive introduction to the Improvement Kata and Coaching Kata that can be used by anyone interested in practicing or coaching the IK/CK. It’s less than three hours of material in 11 modules designed to prepare people for practice, not to take the place of practice.

There are a variety of persons who can use the Online IK/CK Basics course:

**Educators.** Here, I can speak from my own experience. At the University of Michigan, I created a graduate course in lean thinking based on IK/CK. Students worked in small groups on real problems in local companies step by step. They read something or

watched a video before class. In class, we practiced a Starter Kata with a simulated problem, and then the students practiced it in their host company working with a coach. I wish I had had the online course at that time, which is one of the reasons we created it.

**Trainers** can create a more effective approach to training by combining online conceptual learning modules with coached practical application.

**Consultants** will find the “Online Improvement Kata & Coaching Kata Basics” course useful because they can spend less time on conference room training and more time at the gembu with clients learning by doing.

### IK/CK practitioners using the online Kata course

Menasha Packaging Company is the largest independent, retail-focused packaging and merchandising solutions provider in the United States. Their lean journey began in 2002 with great success, and they reached a level of maturity where they thought they could apply any lean tool anytime. However, there were also some problems:

1. There was not much focus to the improvement activities.
2. People tended to jump from problem to solution.
3. People were afraid of failure and thus tended to stick with known approaches.
4. People didn’t identify and acknowledge obstacles to a target condition and did not have the persistence to really overcome obstacles that arose.

Menasha wanted to go to the next level of management, to generate more focused improvement that follows a more scientific approach.

Regional Lean Manager Dan Deringer came to Menasha from a company that was already practicing IK/CK, and he suggested

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they try it. Early in 2017, the seven senior operations managers in Dan’s region used the online Kata basics course to help them get on the same page.

They met and discussed each module, what it could bring to them, and how they could use it in beginning Kata practice with Menasha managers. The plan is that the seven senior managers will be the coaches for their managers. To gain more experience themselves, each of the seven senior managers will first select one learner (manager) and a project, with a challenge for each project. A few of the senior managers already have experience with IK/CK and will coach the other senior managers to get them up to speed.

The effort is now in a pilot stage. The first learners will go through the 11 online course modules in three parts. After each part, they will have a discussion with their senior manager coach about what they learned and how they could apply it, and then begin to practice that element of the Improvement Kata on their focus process in the gemba, coached by the senior manager.

Notice what is not happening at Menasha: Lean staff like Dan are not being tasked with “training up” all the region’s managers in a classroom.

### **An exciting time in the training and education world**

In the past, we would try to first “learn” and then “do,” but learning and doing have become more intertwined in the face of less predictable conditions that require us to develop new habits of more scientific thinking, to meet challenging goals. The myth that students learn effectively from

traditional classroom teaching is being put to rest, which, of course, creates some new training challenges. For example, to change mindset, it’s not enough to interact with a trainer or consultant every few weeks. Nor can internal and external consultants be every place all the time to lead continuous improvement. At best, they can do projects here or there and change things that violate the habits of those in the “transformed” area.

The lean training world seems to be reacting and shifting toward developing line managers as the primary teachers/coaches, and accessing online technologies more effectively to help us get closer to an ideal of daily practice with individualized coaching. In this environment, flipping the classroom is a winning formula.

This does require a somewhat different skillset than the ones conventional lean training centers have developed. Traditional, lecture-based training favors dynamic, charismatic speakers who can engage their audiences to get high course evaluations, and what happens after people are “trained up” is left to chance. When we flip the classroom to integrate teaching and practice, a different skillset is required. First, those doing the training should have some experience and competence in doing what they teach, which the senior managers at Menasha recognize. The old adage “those who can’t do, teach” doesn’t work in this approach. Second, since the teachers will be coaching actual practice, they should be able to quickly read the situation technically, socially and personally. They are challenged to understand how the learner is currently thinking and quickly respond with appropriate feedback.

If charismatic lecturing becomes a less valuable skill, it could shake up the current teaching structure of corporate staffs, consultants and educational institutions. Change is generally exciting for change agents, but less comfortable for those struggling to change. Now the change agents themselves have to change. Ironically, the changes we are talking about are similar to the changes we desire of the managers in a lean system: Transform from order givers and information providers to coaches who engage and develop their people. Forward-looking thinkers like Carl Wieman are well into the journey. How about you?

Here is the good news: Once you try it and get used to it, the newer ways of teaching and training we describe here are more enjoyable and fun for both the learner and the teacher. Learning works best when teachers and students are motivated and engaged. ●

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The Online Improvement Kata & Coaching Kata Basics Course is available to AME members at a discounted rate. Visit <http://bit.ly/2g38Ezy> for more information.