

Close Skill Gaps with
SCIENCE-BASED
LEARNING

articulāte

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Introduction

The World Economic Forum reports that upskilling and reskilling today's workforce has the potential to boost GDP by \$6.5 trillion by 2030. But how can employers accomplish this goal in an era of deskless workers, rapid technological advancement, and near-constant change? As companies grapple with this question, they're looking to learning experts for strategic direction. The answer, according to leaders in the field, is embracing *how the brain actually learns and retains information* to create training that sticks—and measuring that training's success by business impact.

Executive Summary

The skills gap crisis refers to the loss of productivity organizations experience when workers don't have the skills needed to perform their job effectively.

The phenomenon—which has been concerning for decades—has only accelerated in the past few years. The pandemic pushed companies to an inflection point where digitization and hybrid work have become the status quo—and the skills gap can't close fast enough. In fact, this [World Economic Forum report](#) noted that 50% of the world's employees will need reskilling by 2025. Reskilling, upskilling, and redeployment are at the top of executives' minds. Investment in training to address those priorities exceeded [\\$100 billion](#) for the first time last year. Still, experts like [Dan Pontefract](#) worry that “we're throwing the training against the employees and hoping like mad that it sticks.”

Training has enormous potential to boost the bottom line. But for companies to see a return on investment (ROI),

employees must retain the skills they learned and be able to apply them in the field. Unfortunately, that doesn't always happen.

This e-book explores two common mistakes companies make when trying to close the skills gap:

- **Rely on one-touch training methods that don't take advantage of the brain's natural learning preferences—over time, in multi-faceted, multi-touch environments.**
- **Claim success based on measurements like attendance and satisfaction scores rather than tangible business impact and ROI.**

To avoid these mistakes and deliver real results, it's imperative to offer flexible, continuous training designed for how the brain engages with and retains information and to tie success to measurable business outcomes.





Chapter 1

The Skills Gap Problem

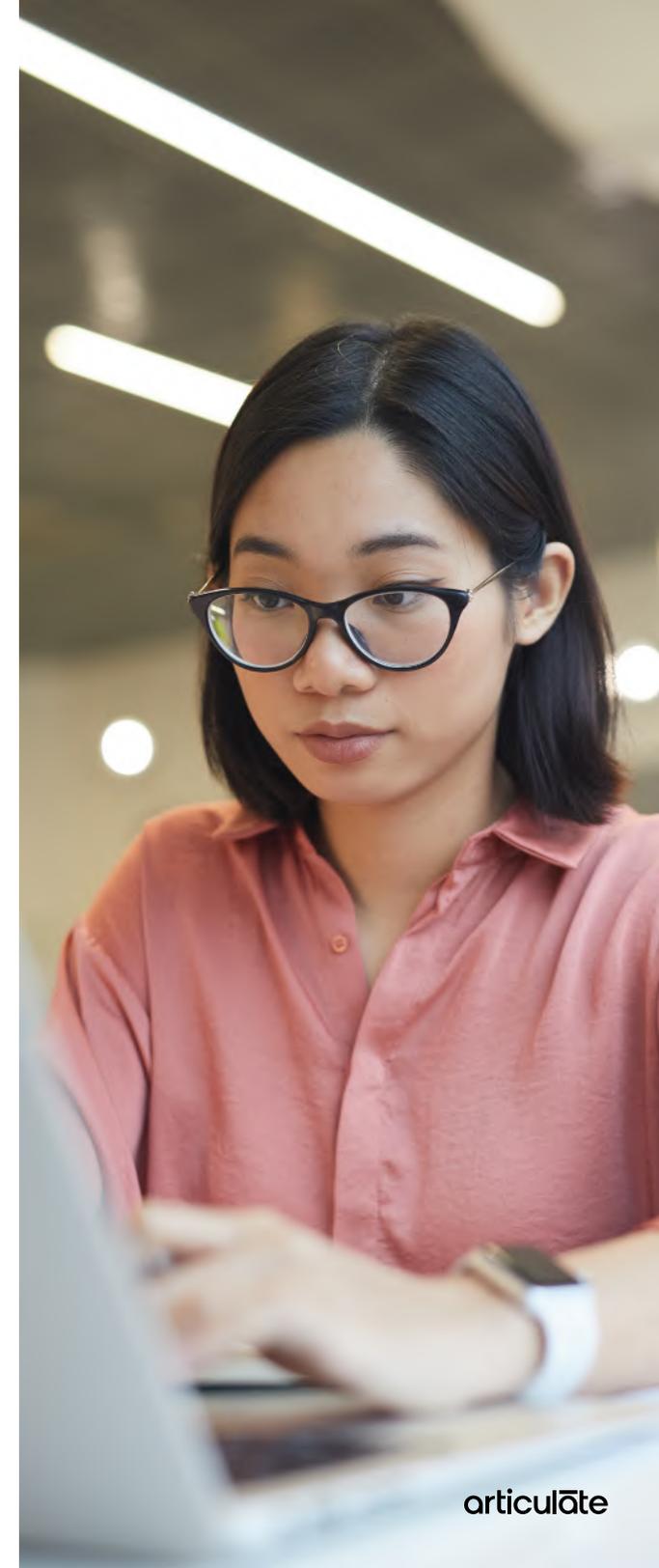
The Skills Gap Crisis: What It Is, and What's Causing It

The skills gap crisis is a simple problem: Today's employees don't have the skills they'll need to do tomorrow's jobs. Skills become obsolete faster than companies can train existing employees or onboard recruits with those skills.

Technology and automation advances have accelerated the pace of change at a staggering clip. [Research suggests](#) that 1.1 billion jobs may be "radically transformed" by 2030 due to technological changes. Consider advances in artificial intelligence, robotics,

quantum computing, and 3D printing—to name a few. Our tools move faster and do more than our highly specialized workforce can learn.

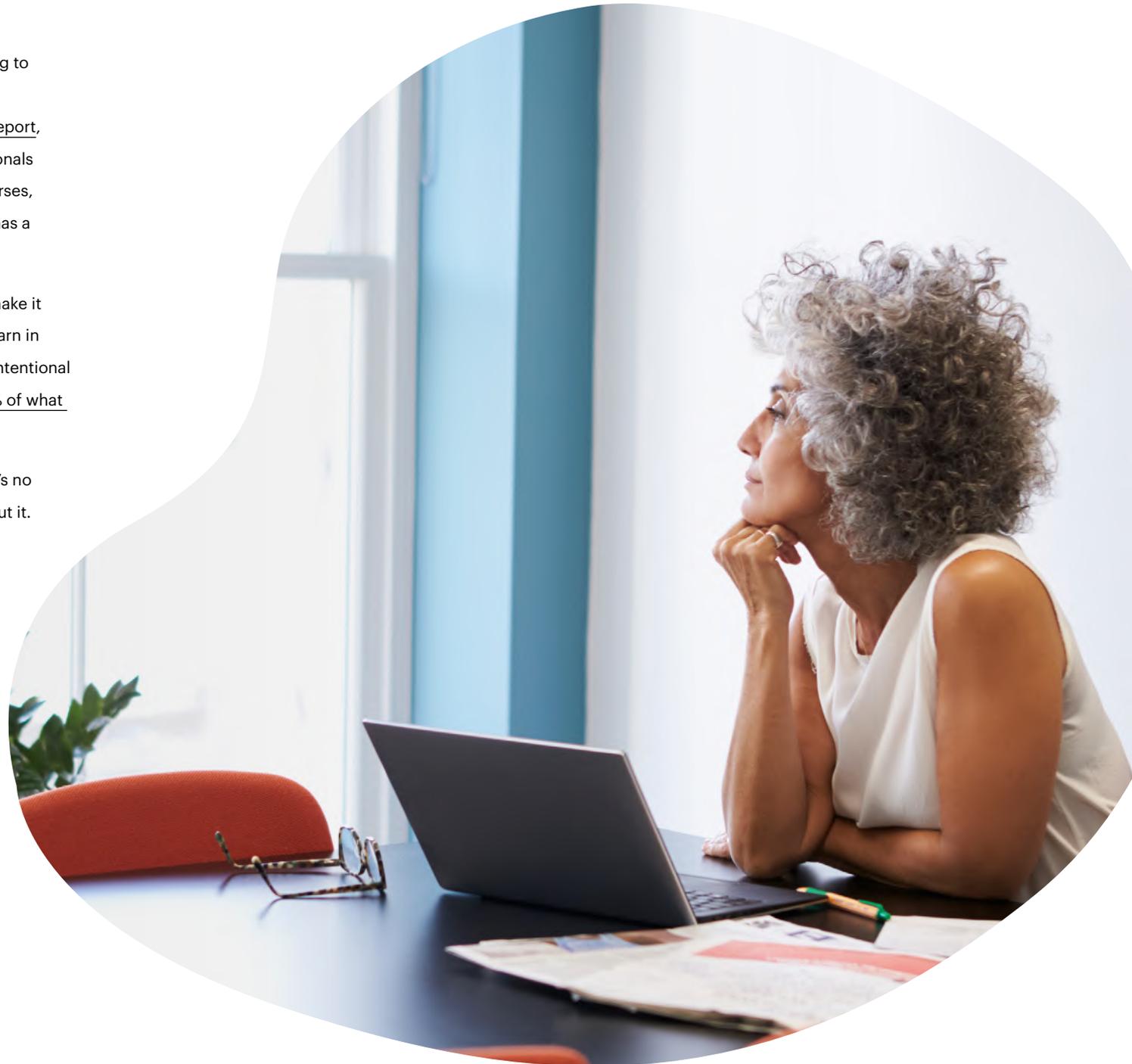
2021 data from [Gartner](#) confirmed the trend with findings that the number of skills employees need to do one job has increased by 10% every year since 2017. They also discovered that one in three skills listed in the average IT, finance, or sales job posting is already obsolete.



With all this change, organizations are struggling to develop training fast enough to close skill gaps. According to Training Industry's 2023 Annual Report, by the time learning and development professionals consult stakeholders, build comprehensive courses, and implement a new program, the workforce has a new problem.

Finally, passive one-off participation methods make it difficult for employees to retain what they *do* learn in workplace training. Studies show that without intentional practice, learners will forget approximately 90% of what they studied within days.

With all of these forces causing the skills gap, it's no wonder many organizations are concerned about it.





The Skills Gap Crisis: By the Numbers

87%

87% believe they're facing a skills gap now or will in the next few years ¹

66%

66% of workers surveyed in 190 countries are willing to retrain ²

53%

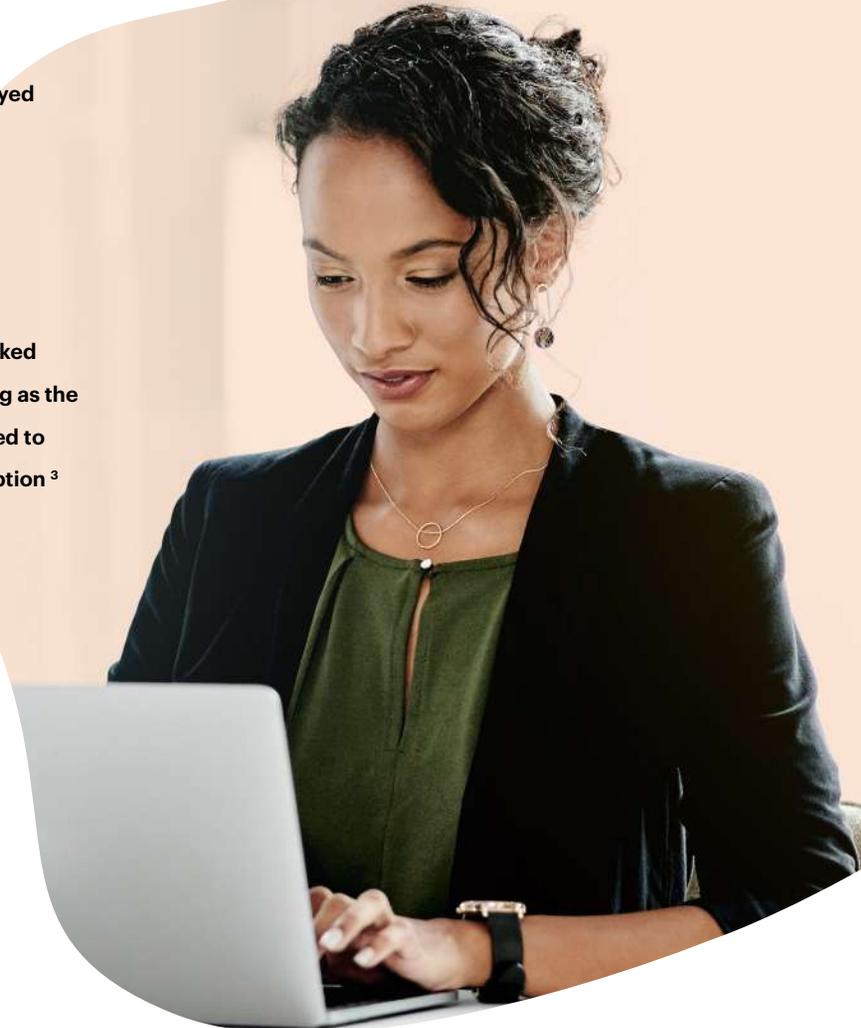
53% will prioritize skill building ¹

72%

72% of executives ranked reskilling and adapting as the top capabilities needed to navigate future disruption ³

20%

20% will move workers to new roles ¹



Sources:

[McKinsey 2020](#) ¹

[Boston Consulting Group Report](#) ²

[Deloitte 2021 Human Capital Report](#) ³

Minding the Gap

One [2019 survey](#) of 600 HR leaders reported 64% were concerned about skill gaps at their company, up 52% from the previous year. So we know these factors emerged well before 2020, but the global pandemic only compounded the issues and made them impossible to ignore.

In the face of a once-in-a-century pandemic, leaders rushed to identify the skills and tools needed to keep up and equip their teams to meet day-to-day needs. Businesses demonstrated unprecedented agility to survive. But as we ease into a post-pandemic world, the skills gap looms more prominent than ever, and companies need sustainable solutions.

Despite returning close to business as usual, companies aren't able to keep up with the continual need for new skills. One [2022 LinkedIn report](#) noted that the required skills for an occupation changed by 25% between 2015 and 2021.

**50% of employees will
need reskilling by 2025**

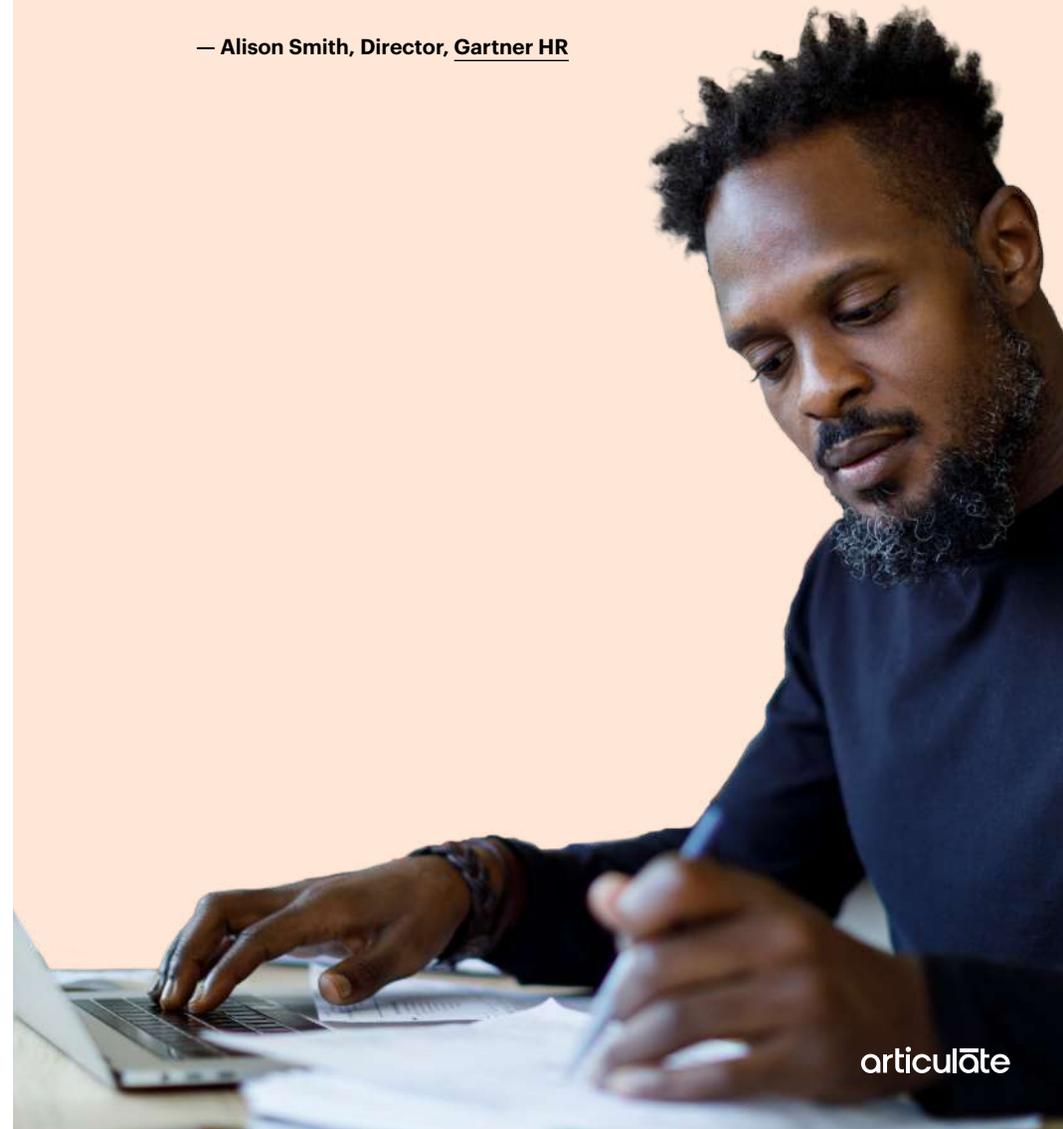
Source: [World Economic Forum](#)

Age Is Just a Number

With four generations in the workforce, it could be tempting to assume that replacing outdated skills disproportionately affects older workforce members. But data shows a comprehensive cross-generational impact. One pre-pandemic study by global recruiting site Indeed found that 50% of searches across generations were for “routine work” at the highest risk of automation. Additionally, younger generations report soft skills deficits that further compound their risk. The pandemic only exacerbated existing skill shortfalls in negotiating, networking, and public speaking. Thus, the skills gap is not a problem that will go away as older generations age out of the workforce. Implementing effective learning strategy impacts all generations and investment will continue to grow.

“In today's environment, hiring is not possible for many organizations. Instead, companies can look at current employees who have skills closely matched to those in demand and utilize training to close any gaps.”

— Alison Smith, Director, Gartner HR



The \$100 Billion Question

Training Industry data shows that U.S. training budgets exceeded \$100 billion for the first time in 2021-2022. The first question you might ask is, “Where is that \$100 billion going?” Survey respondents represented U.S.-based corporations and educational organizations with at least 100 employees reporting these key budget drivers:

- **Increased scope for training programs**
- **Training more employees**
- **Sourcing new technology or equipment**

Additionally, they cited management training, onboarding, and interpersonal skills as the top courses.

Upskilling Today: By the Numbers

 **10%**

10% YOY increase since 2017 in the skills needed for one job ¹

 **\$1,207**

\$1,207 spent per year by companies on the average learner ²

 **72%**

72% will continue to deliver all or some training online ²

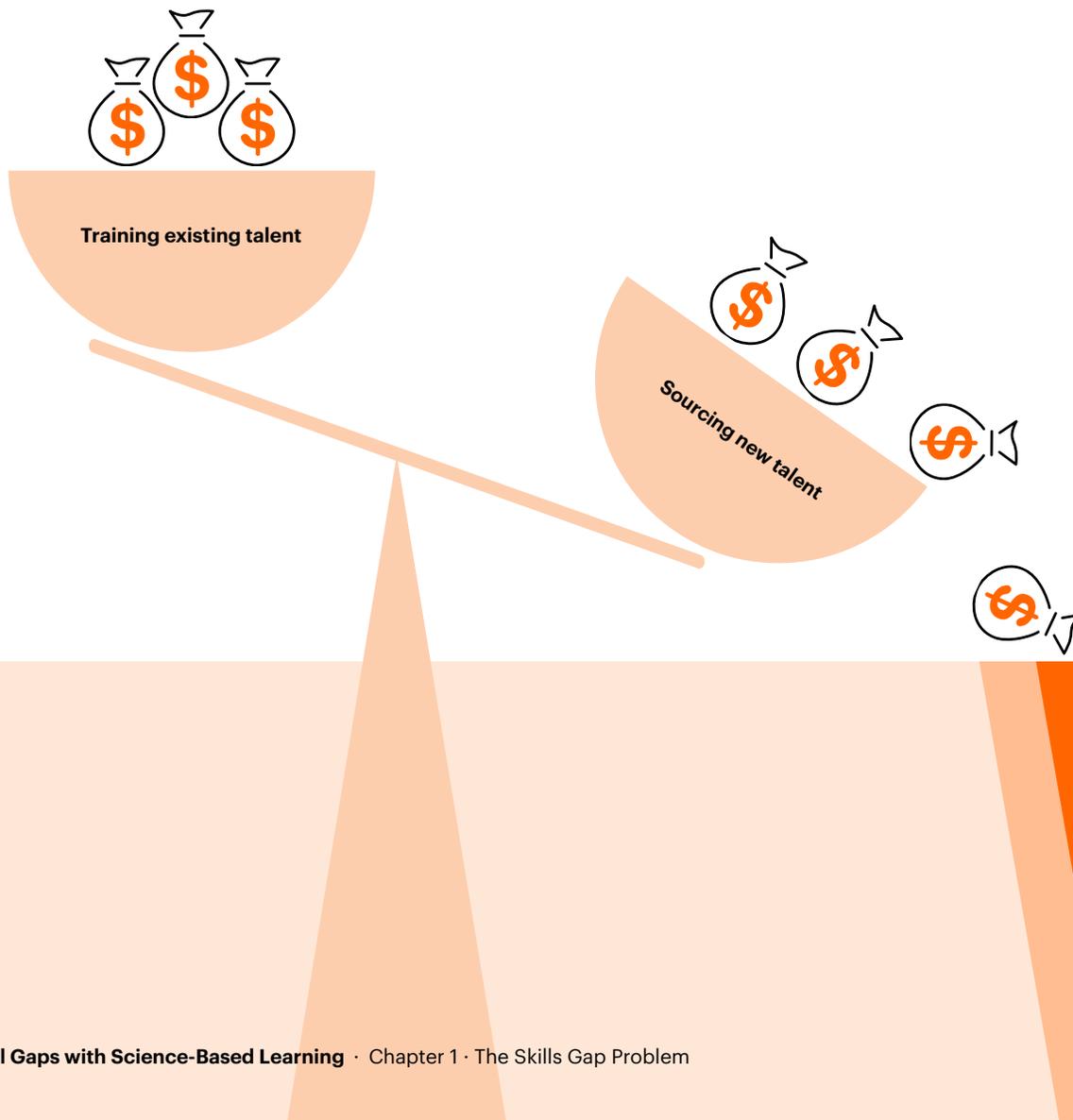
 **\$100B**

\$100 billion total spending on training in the U.S. ²

Sources:

Gartner Research ¹

Training Industry 2022 State of the Industry report ²



Interestingly, trends indicate that employee engagement and retention are directly tied to learning and growth opportunities available to them. Here, upskilling becomes another cost-saving measure. First, it helps to stem soaring turnover rates (and the associated costs), and second, leveraging existing talent in new ways is significantly cheaper than sourcing new talent. Organizations that adopt an agile, responsive, and accountable training approach keep good employees and reduce the costs associated with finding new talent.

So the next, and more important, question is, "Is that \$100 billion well spent?" McKinsey found that the majority of executives don't think so—more than 61% believed programs are rarely or only sometimes successful.

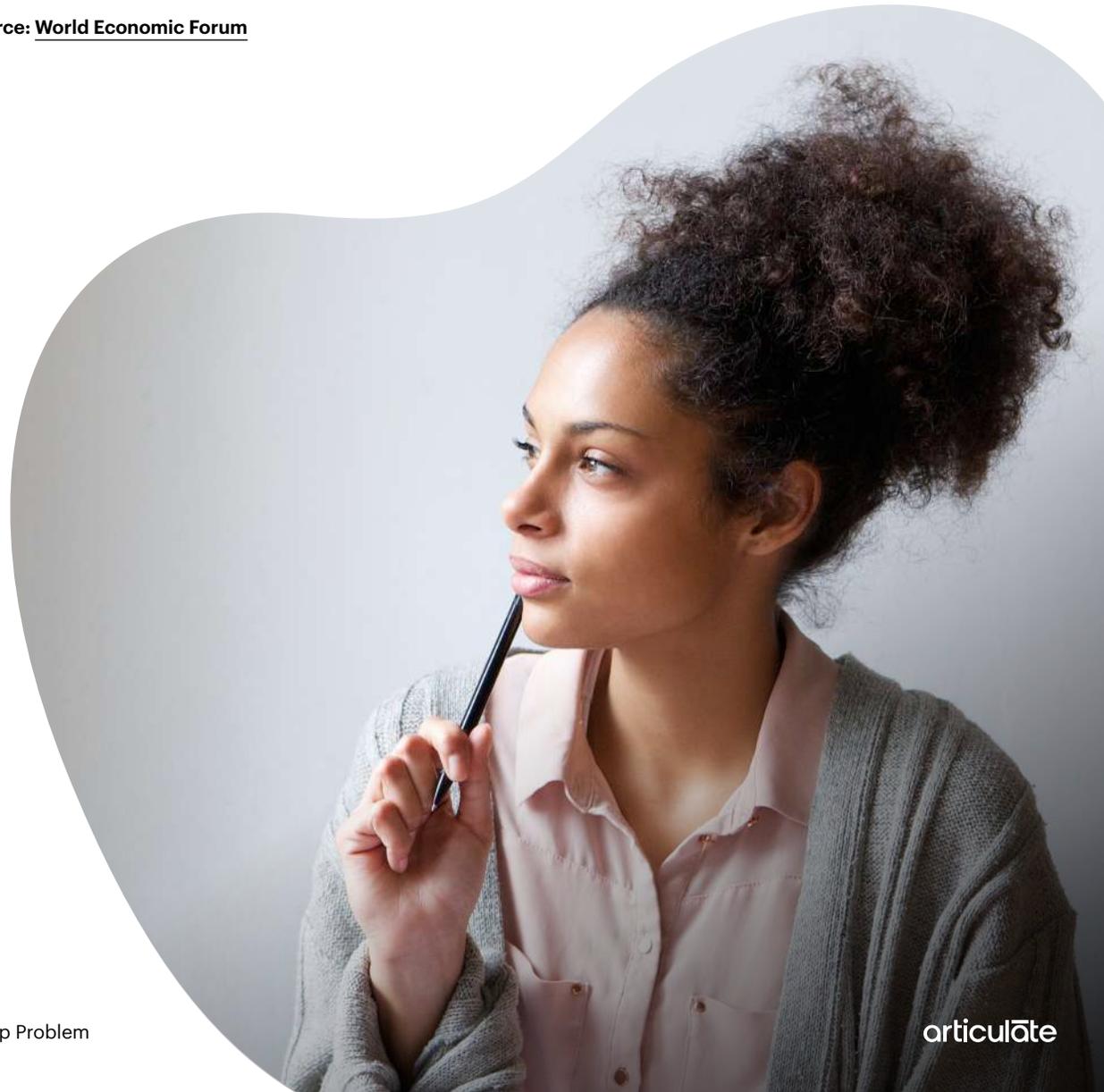
Does that mean we should stop investing in training?

No, but it does reveal some tough truths about using training resources effectively. And that's critical, because multiple surveys have found that organizations are actually increasing their learning and development budget year-over-year, even post-pandemic. The same [Training Industry report](#), for example, noted a steady increase from \$83 billion just four years ago. The takeaway is this: Spending more money won't help unless we also think critically about how we train.

Moreover, training dollars of that magnitude should be considered an investment rather than an expensive employee benefit. Workplace learning must evolve to meet the needs of the business and the employees. Most importantly, it must deliver on the promise to drive measurable change while remaining responsive to shifting market demands.

“[World Economic Forum] research done in collaboration with PwC shows that wide-scale investment in reskilling and upskilling has the potential to boost GDP by \$6.5 trillion by 2030.”

— Source: [World Economic Forum](#)



The Future of Upskilling and Reskilling

The skills gap crisis impacts a broad cross-section of workers. Responding to that skills gap is a business imperative. But, as we've covered, throwing money at the problem is a short-sighted recipe for failure. Instead, learning and development teams must focus on four guiding principles:

1. Abandon the linear “one-and-done” learning methodology and instead align with science-based, variable learning methods.

2. Think beyond the classroom and integrate learning into multiple touch points throughout the day-to-day flow of work.

4. Use technology to foster business agility, skill mobility, and continuous learning.

3. Tie learning objectives, success criteria, and budget investment to measurable business ROI goals and behavioral objectives.

This approach can create tremendous business value—as noted in the introduction, a \$6.5 trillion GDP boost is at stake. But to see the bottom-line impact, we must reframe the training line item from “employee benefit” to “investment.” This means moving away from outdated measurements and techniques and centering science-based, data-backed programs directly tied to business outcomes. Leading companies are already doing this, and seeing results. In the following chapters, we'll explore how.

Chapter 2

Did You Forget Something?

Remember to Learn

Think about the last training session you attended. For many, it went like this: Head to a classroom or sign on to a training module. Watch an engaging (or not-so-engaging) speaker present the required skill. There may have been snack breaks, some awkward role-play exercises, and a simple multiple choice test at the end. You may have received a badge or certificate of completion. Sound familiar?

It doesn't matter if the training is very interesting or a snooze-fest. If training follows this present/test/leave model, the company may as well have thrown the money out the window. Participants will forget what they learned in a matter of days.



Mistake #1: Forgetting the Brain

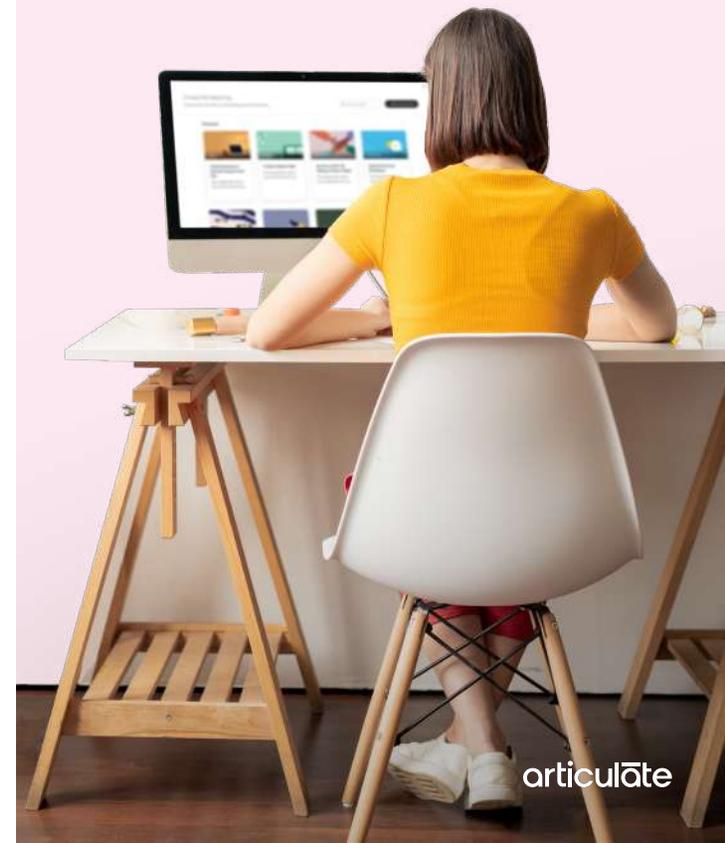
The problem with the previous scenario is that it asks the learner to strap in for a predetermined ride until it's over. The approach is efficient if we count the number of bodies going through the system as a success metric. But one-and-done, passive training is well-known to fail in the long term. For more than a century, since Ebbinghaus's 1885 [Forgetting Curve theory](#), cognitive psychologists have known that our memory of a topic is directly related to how long it's been since we've learned or applied it. While Ebbinghaus's work has been confirmed with subsequent studies, it has also been augmented by a richer and more nuanced understanding of how people learn. Yet many organizations persist in structuring learning in ways inconsistent with the brain's ingrained learning requirements.

Instead of passive, one-time-only delivery, an ideal structure must pull from science about how the brain learns. It must be flexible and responsive to the learner. It must be applicable and continuous. Most of all, it must be challenging and novel, providing the learner with opportunities to repeatedly and actively engage in new material and struggle to remember old concepts in a learning cycle.

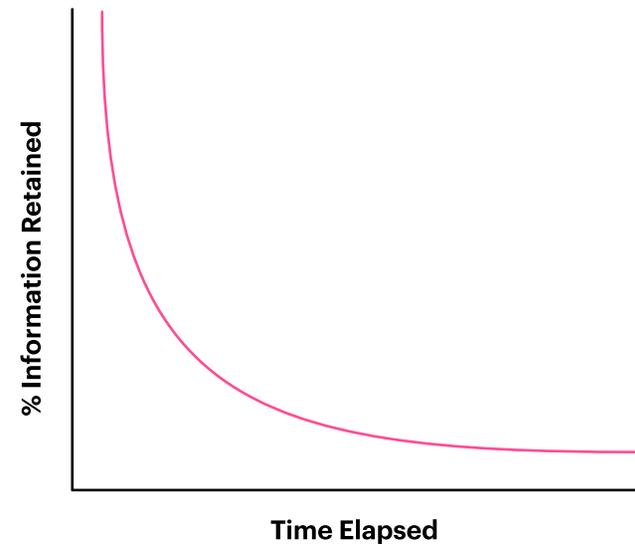
Let's look at some helpful research and related best practices.

“Any time we can help employees retain the skills we helped them develop, the more likely they are to use that skill, and that in my opinion is at the heart of great training programs.”

— Ken Taylor, President and Editor-in-Chief,
[Training Industry](#)



Ebbinghaus's Forgetting Curve and Its Impact on Training



German psychologist Hermann Ebbinghaus studied memory. His discovery that we remember less as time goes on is undoubtedly intuitive. Unlike many other theories from more than a century ago, [Ebbinghaus's Forgetting Curve](#) remains well respected, and his research is consistently

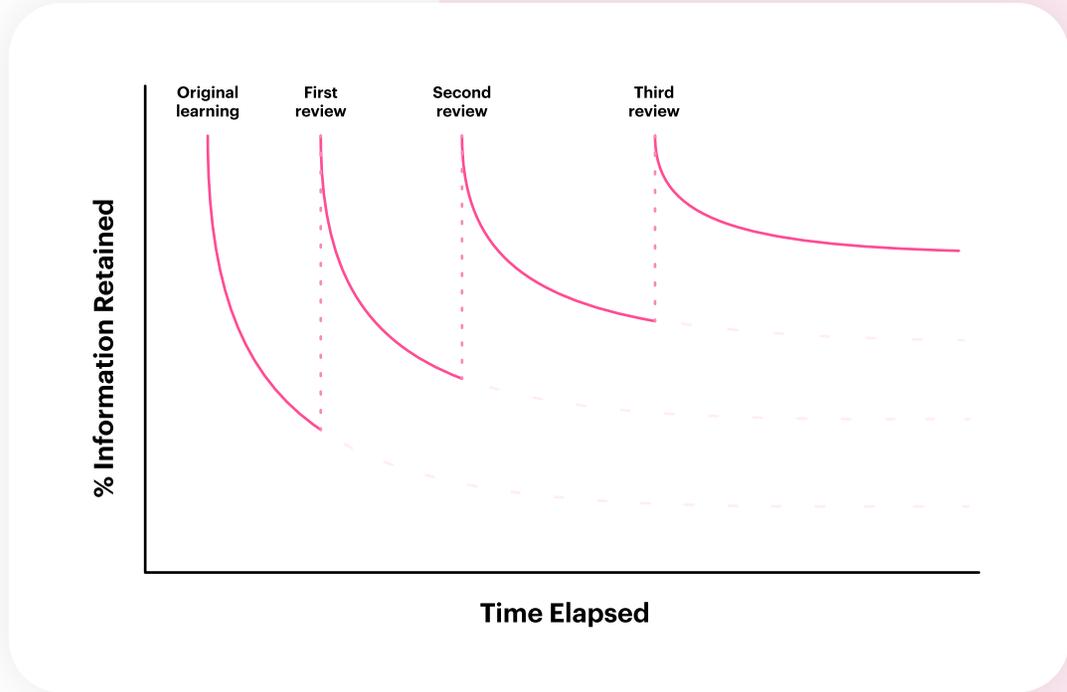
reproduced. But cognitive psychologists have built on his theory and discovered ways to short-circuit the time-lapse effect and help learners retain information longer. Next, let's look at a few applicable methods.



The Spacing Effect

The first tactic Ebbinghaus discovered was that simply repeating and reviewing the learned information at deliberate intervals improved retention over time. He called this the **spacing effect**. Allowing time in between learning sessions is critical. He theorized that when the brain has to work harder to draw the information forward, that hard work enhances long-term retention.

He and other researchers realized that the passive presentation model is quick and offers the tantalizing illusion that the learner understands the course material. But quiz the learner about the course material a month later, and you're likely to get a blank stare. The short-term pleasure of learning something quickly and easily doesn't last. Introduce challenges over time, and the learning process feels much more demanding. It might even be unpleasant or frustrating. Yet that transitional space between learning the concept and re-engaging in it is full of opportunity for impact. Spaced learning applies the spacing effect by spreading learning or training over time and repeatedly engaging with the material to draw out retention time longer.





Building on Ebbinghaus's Work

Cognitive psychologists have shown over decades of research that spacing isn't the only technique that works. Other variables can increase retention. Testing-to-learn and interleaving may work with spaced learning tactics. Psychologist Robert A. Bjork calls these methods **desirable difficulties**—tactics that “slow down the apparent learning but under most circumstances help long-term retention and help transfer of knowledge.”

Employing desirable difficulties has a small downside. It can make learning feel harder and slower. In practice, it may feel counterintuitive—and maybe a little painful. Yet Bjork explains that it requires the learner and instructor to “have a different view—they need to keep their eye on ... the long-term goal of learning, and not the immediate consequences of performance.”





Testing to Learn

One such desirable difficulty tactic is testing to learn. A 2006 study by Roediger & Karpicke researched this technique by comparing two groups and studying whether testing could help them retain information.



Each group had four blocks of five minutes to study new material.

Group One

Group one used each five-minute block to read the material.

Group Two

Group two used the first five-minute block to read the material. They were not allowed to review the material again. Instead, they used the remaining three blocks to test their memory of what they'd studied.



Both groups completed their study time and took a final test on the material.

Group One

Group one, who'd spent 20 minutes passively reviewing the material scored 83%.

Group Two

Group two fared worse, scoring only 71%.



One week later, the researchers invited the subjects to return and take the test again.

Group One

Group one's scores dropped by half to 40%.

Group Two

Group two's scores had **only dropped 10 points to 61%**.

The researchers theorized that this desirable difficulty—testing to activate memory—improved retention. They called this “The Testing Effect.”



Interleaving

Interleaving is a method to aid skill building. It is proven to enhance learning retention and the ability to apply learning in new contexts. However, at first blush, it may sound counter to the famous “10,000 hours rule” that suggests about 10,000 hours of practice and repetition of a single task leads to mastery.

Think about a typical classroom—usually, an instructor progresses from easy tasks to difficult ones. Students might drill an activity until they grasp the concept, and the instructor moves to the next, increasingly tricky subject.

By contrast, interleaving mixes skills and tasks of varying difficulty in a single session, rather than working through one skill before advancing to the next one. The research shows that this method encourages the brain to pull from old knowledge and solve novel problems by building conceptual connections. That desirable difficulty improves knowledge retention and the ability to apply it cross-functionally.

For example, a typical math class might study multiplication tables for a week then move to the next concept. A math class employing interleaving might include multiplication tables, a logic problem, a hands-on beginning geometry project, and a subtraction review in one learning session. Students could expect classes to be harder and time to proficiency longer—but long-term application and retention in each competency can improve dramatically.

Typical Math Class

Week 1: Multiplication

Week 2: Logic Problem

Week 3: Geometry

Week 4: Subtraction

Interleaving Math Class

Day 1: Multiplication

Logic Problem

Geometry

Subtraction

“Learning shouldn't be treated as a one-shot deal—it must be an experience that unfolds over time”

— Will Holland, President, Expand Interactive (Quoted in SHRM)

Desirable Difficulty at Work

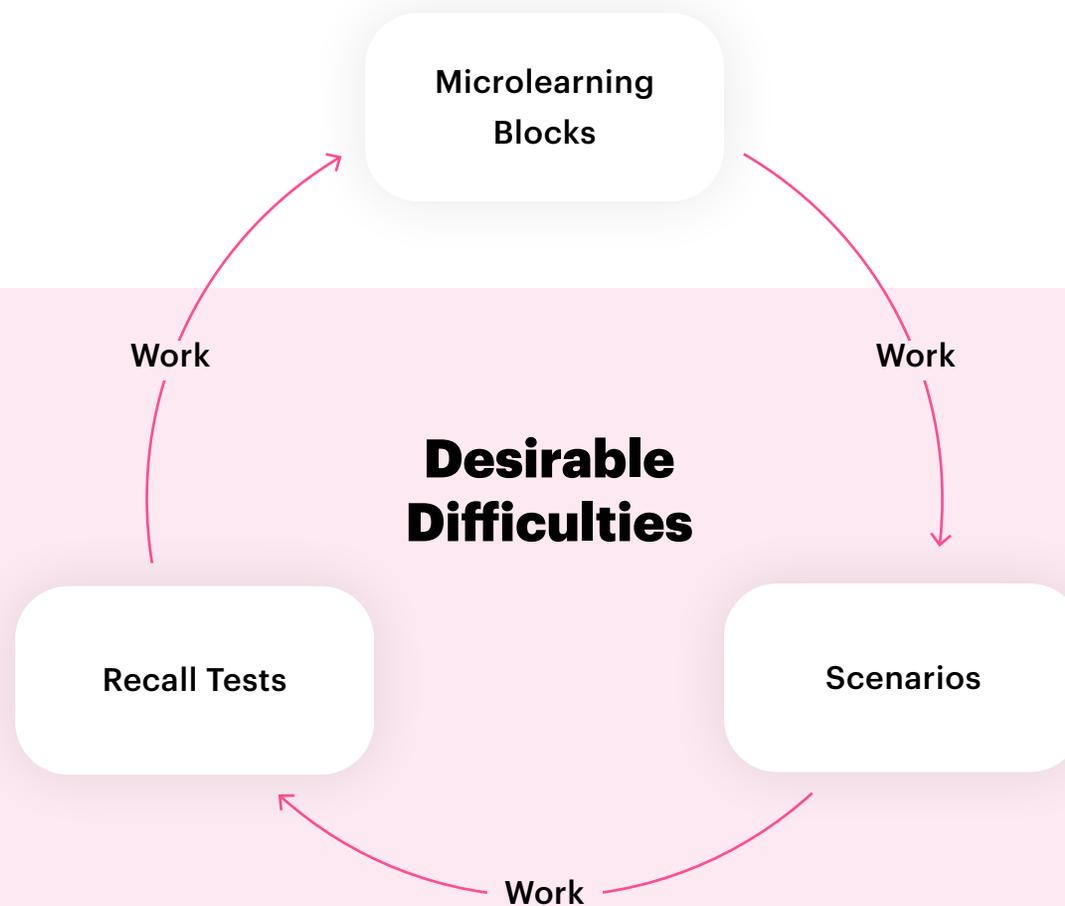
Let's return to the scenario at the beginning of the chapter that involved a presentation, role-play, quiz, and certificate of completion, and consider some brain-stimulating practices to enhance it.

- **To employ spaced learning, the first and easiest adjustment is to move from a one-time training session to a multi-touch experience. Rather than one day of learning, the instructor might connect with the learners before, during, and in multiple follow-ups after the class.**
- **To leverage testing to learn, the instructor might send a pretest before the training session seminar asking participants to draw on knowledge they already have before joining the class, offer quizzes throughout the course, and send follow up scenarios to test participants' recall of the concepts.**
- **Perhaps passive listening sections remain, but the instructor might employ interleaving by introducing challenges for attendees to solve in new ways. The course could reference previous lessons requiring learners to pull what they remember and apply it in a new context. Or, they could apply a mix of learning tools and methods to practice one skill.**

Thus learning becomes an engaging and evolving process that's slower to bloom but creates deeply rooted knowledge that endures. Throughout, it's critical to allow "productive struggles," says [Rishi Sriram](#), associate professor at Baylor University's School of Education. In the struggle, he says, "Students will make more mistakes, but these mistakes are productive because they build better roads in their brains."

Remember, integrating learning into the natural flow of the workday—with multiple touch points, taking full advantage of workplace technology—is a key to unlocking knowledge retention. Online course development tools play an integral role in this kind of learning because they allow flexibility and responsiveness to adapt to learners' needs. Authoring tools allow instructors to move quickly to develop short and impactful recall tests, microlearning

blocks, and scenarios that can integrate into daily workflows. Each learning touch holds an opportunity for novel and challenging "desirable difficulties" that build a continuous cycle of re-engagement with, and thus retention, of the course material.



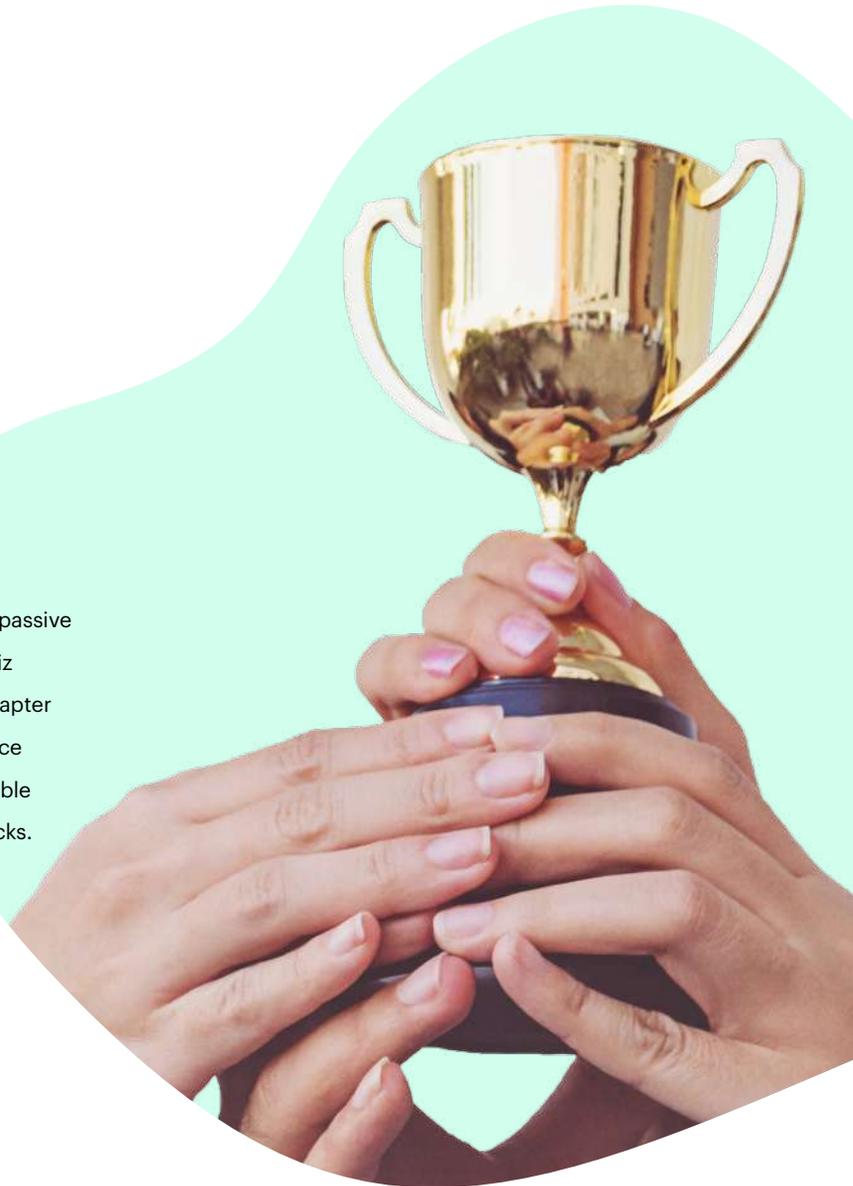
Chapter 3

Training with ROI in Mind

Mistake #2: Participation Trophies

With budgets stretched tighter than ever, maximizing every dollar spent on upskilling team members is critical. Yet, according to [LinkedIn Learning's 2022 Workplace Learning Report](#), the number one measurement tool organizations employ to assess impact is qualitative team member feedback. Others use success assessments like attendance

numbers, hours in training, and completion of a passive content/content/quiz model where a passing quiz dubiously equates to skills built. As we saw in chapter 2, learners must have the chance to learn, practice the desired outcome, and even overcome desirable difficulties to achieve behavioral change that sticks.



Let's say a retailer invites 10 regional sales managers to a customer service workshop with a well-regarded industry expert. The corporate office justifies the expense by assuming the managers will pass those skills on to front-line employees. Costs for the event include the speaker's fees, transportation, refreshments, and a one-night hotel stay for each attendee—totaling about \$15,000, or \$1,500 per participant.

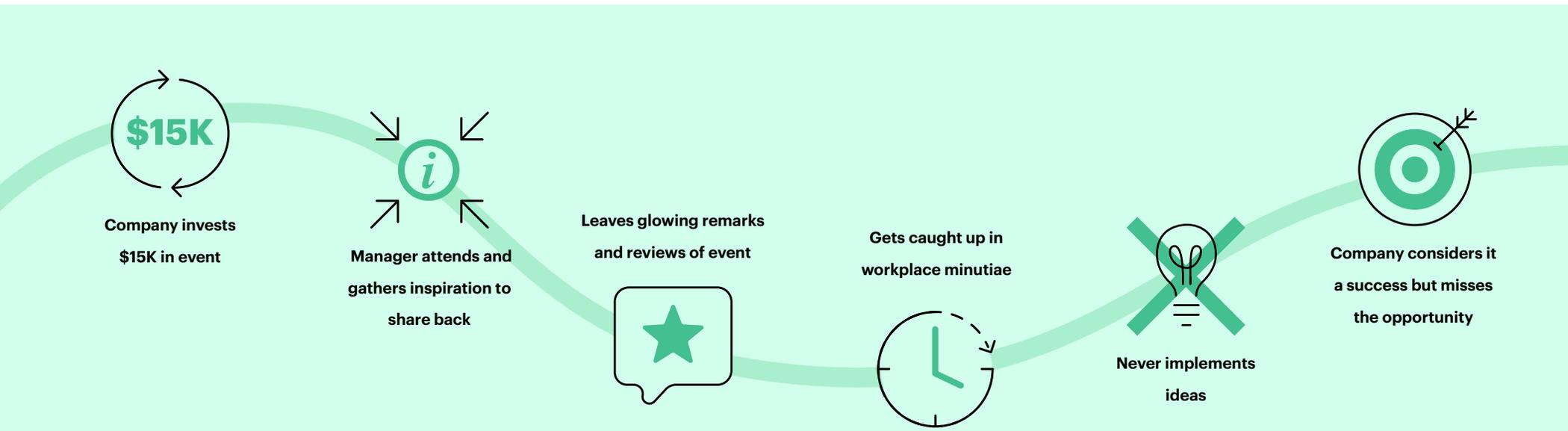
Monica's region has room to grow, so she's excited to attend. She takes copious notes during the speaker's exciting presentation, thrives in breakout discussions, and fills out a glowing post-session satisfaction survey. She's thrilled to return and share new ideas with her team. But when she arrives at the store, an associate needs a hand

with a complicated return. Then, an assistant manager asks her to approve the next month's schedule. The stock manager delivers bad news about an expected shipment. By the end of the day, the buzz from her newfound knowledge has faded. By the end of the week, Monica hasn't found a schedule opening to teach her team the new concepts. By the end of the month, she opens her notes and can't quite recall what they meant. Regretfully, she shelves the notebook and moves on.

It's clear in practice that Monica's experience missed the mark. But on paper, many companies would call hers a success story. After all, she enthusiastically participated in the training. The speaker earned 5/5 stars on every survey. But Monica and her peers failed to implement

their learning back at home. What went wrong?

The company invested in an expert speaker and invited company leaders to participate. In turn, those attendees said the experience was informative and engaging. While there's nothing wrong with a solid presentation or trainee satisfaction scores, that approach misses half the equation. What Monica experienced was like handing out sports participation trophies just for showing up at a great game. The problem is how her organization measured success. They called happy bodies in seats a win, but enthusiastic participation in a one-off training program won't deliver lasting learning, skills application—or ROI.



Made to Measure

Presumably, Monica's company felt customer service training would benefit the bottom line, or they would not have spent the time, money, and effort to offer it. But what if, when considering the event, Monica's company tied success to a measurable ROI?

For example, leadership identifies a tangible customer service business outcome rather than hosting a generic customer service training program. The desired result is to "Provide customer service that increases average customer ticket value by 20% next quarter." The instructor would build the entire training program with that goal in mind.

ROI \$

The instructor could leverage optimal brain-friendly learning practices to design training that supports the desired outcome. It could include some traditional passive instruction but also incorporate desirable difficulties like spacing, testing to learn, interleaving, and feedback. The instructor could use quizzes and microlearning segments to bolster learning over time. Or they might consider triggers where short-burst training could reinforce certain desired behaviors in the field—all tailored to help the team achieve a 20% increase in average ticket value.

The entire design would utilize what Tom Kuhlmann, E-learning expert, calls the Tell, Show, Do model. This behavioral change-oriented approach starts by telling people what they will learn, showing them how to use real-world applications and processes, and offering guidance to get information when needed. Finally, the student takes a shot at executing the skill themselves. They may try the new skill in different contexts, receive feedback, and adjust before trying again. Every step is in service of achieving that desired business outcome—with success measured in dollars and cents.

“If the end goal is for the learner to do something specific (and measurable) then the training needs to integrate the activity and decision-making required to do what's learned.”

— Tom Kuhlmann, Chief Learning Officer, Articulate





Monica's Sample Training Program

Business: Home goods retailer

Objective: Bespoke customer service leads to a 20% increase in average ticket total over last year's Q2 totals.

“Leaders should treat skilling as a business investment — an asset that will help produce profits over several years, with clearly defined business, people, and learning KPIs as a starting point for the program design.”

— Source: [HBR](#)

○ Pre-Training Prep

- Online pretest: What are the three most important customer service skills that lead to increased sales?
- Pre-training online microlearning: What does your customer really want?
- Pre-training writing exercise: Identify two tangible sales barriers for your front-line associates.

○ Training Day

- Pretest review and feedback session
- Speaker: Three most important skills to increase sales
- Group workshop: Removing barriers for associates
- Through the customer's eyes: Evaluate secret shopper footage; co-create sales opportunities
- Action session: Create a five-step plan
- Post-session review: Recall test
- Teach it back: 15-minute “Aha”s in a teach-to-learn session

○ Post-training Week 1: Store-level all-team meeting

- Teach front-line employees what you learned
- Front-line employee online microlearning assignments and deadlines
- Note baseline and goal: 20% increase in average ticket
- Set reporting and review cadence with the team

○ Post-training week 2: Continued learning and check-in

- Instructor delivers online scenario test covering a new upsell opportunity (branch to more learning or test-out)
- Instructor/participant 10-minute check-in

○ Post-training Week 3: Problem-solving

- Instructor delivers problem-solving quiz for manager and front-line employees based on barriers identified in check-in

○ Post-training Week 4: Review and adjust

- Instructor delivers three- to five-minute micro lessons for front-line staff to review core concepts on the sales floor between customers
- Review average ticket sales and adjust tactics as needed

A training cadence customized for the brain, to serve business goals, does require investment and time. But remember, this program is tied to clear business goals—making the ROI measurable. If Monica and her team can increase average ticket sales by 20% over the same quarter last year, it's easy to point to that ROI number.

Conclusion

Conclusion

We've known for decades that the skills gap has gained momentum, an effect further amplified by the pandemic. To address the gap, companies have invested big—exceeding \$100 billion for the first time last year. But that investment is wasted if we push passive, one-and-done training and hope something sticks.

As business leaders continue to seek ways to effectively close costly skill gaps, learning and development teams must play a strategic role in organizational growth. Using methods proven by cognitive science and tailored to how the brain learns, businesses can confidently tailor training to optimize knowledge retention. And it's critical to round out the program by measuring impact on business performance.

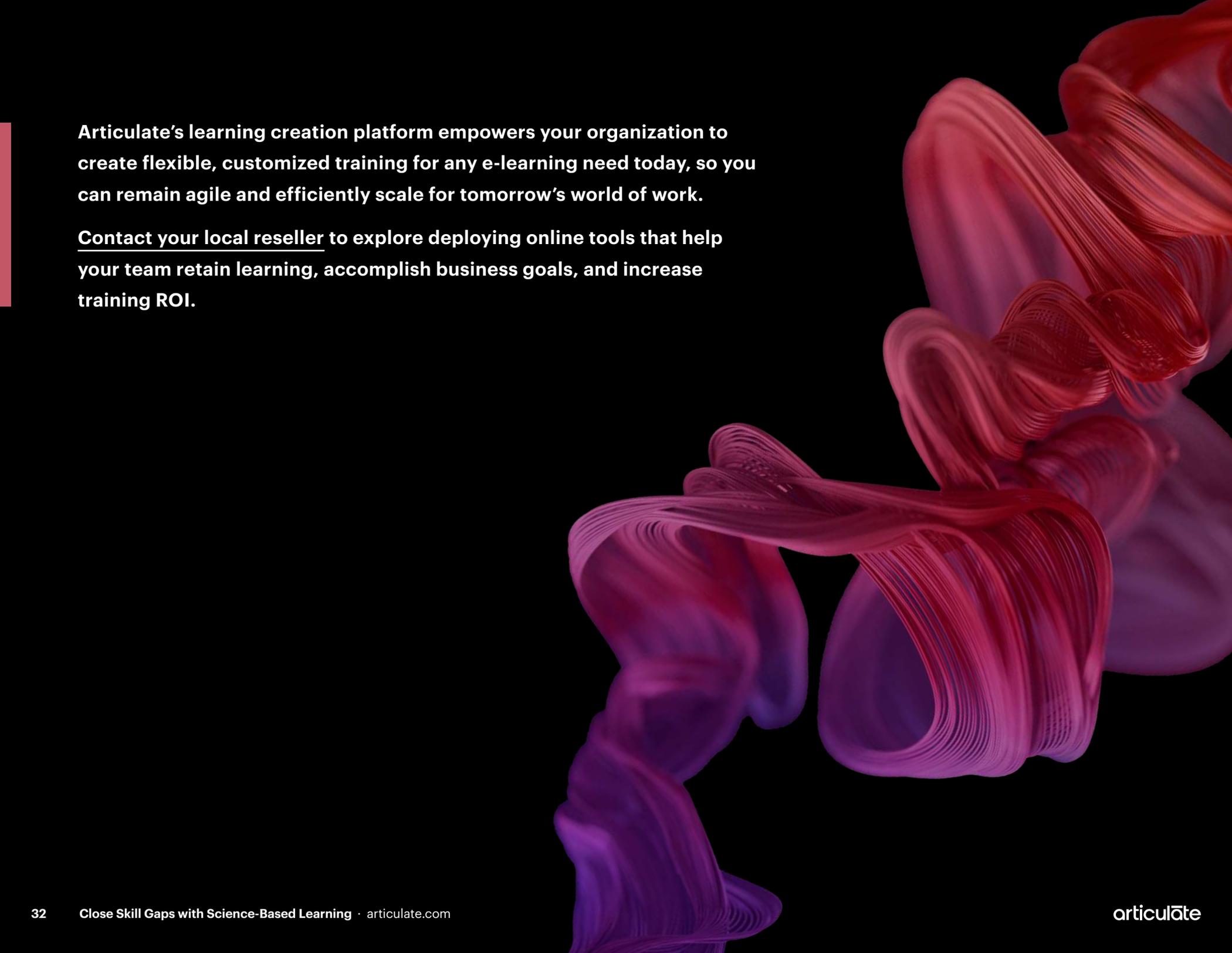
Online learning tools offer the agility to tailor training to business needs and meet learners at multiple touch

points with various tactics. Training with microlearning, applicable scenarios, and testing to learn provides a learner with contextual practice to help:

- ❑ **Recall and retain knowledge**
- ❑ **Redeploy skills in new contexts**
- ❑ **Digest learning in small chunks between daily tasks**
- ❑ **Reinforce and build upon actions to achieve business goals**

To close the skills gap, we must move fast and deliver consistently to keep training top of mind. Proven, science-based learning tactics and ROI-driven goals will inspire lasting and beneficial change. Utilizing these methods will ultimately deliver the bottom line impact held in that \$100 billion investment.





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