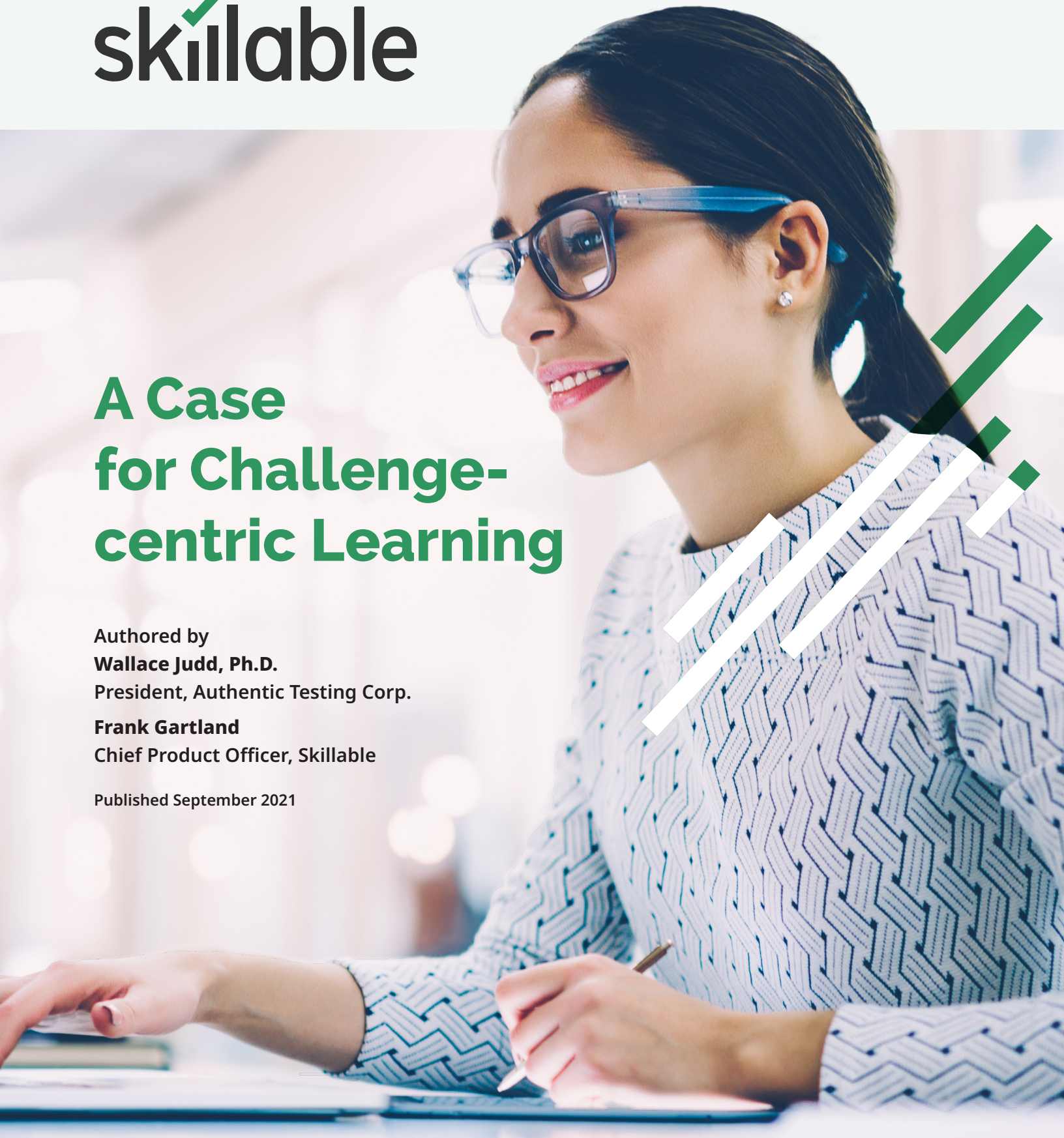
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A Case for Challenge-centric Learning

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Adult learners develop skill mastery and confidence concurrently through hands-on learning experiences that validate the outcomes of their actual performance.

Humankind has experienced three learning revolutions that impacted the generations to follow: The Agricultural Revolution, Industrial Revolution and Computer Revolution.

While vastly different in context, each of these generational learning cycles was driven by a fundamental methodology – "I'll explain it to you, then I'll show you, then you can give it a try" (aka, "tell me, show me, let me"). Each enabled new innovations to thrive and drive the next revolution.

The Agricultural Revolution enabled people to produce enough food to survive. Shifting from hunter-gatherer societies, each generation showed the next how to sow and harvest, adding lessons learned along the way.

The Industrial Revolution enabled us to produce more than ever. Prior to the Industrial Revolution, every town and village had families named Smith, Black, Cooper and Weaver, correlating trades with family heritage. Each generation taught the next every trick of the blacksmithing, barrel-making or cloth-making trade.

These traditions prevailed until technologies gave rise to new manufacturing industries.

The Computer Revolution has accelerated the pace of change in how we work, communicate and recreate more than any other single factor in history.

However, in many ways, trainers and teachers, authors and employers, and even online training programs have continued taking traditional queues by leaning heavily on "tell me, show me, let me" as their primary instructional design methodology. This methodology has worked for millennia, but can we do better? Employment and workplace journalist Cath Everett emphasizes the criticality of workforce ***flexibility*** in a post-pandemic world. That flexibility implies not only alternatives of location, but also flexibility of methods.[1]

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Learners are ready for a hands-on revolution

Since the 1980s, much research has been done to find better methods of teaching adults how to use software-based technology. From the beginning, simply placing learners into the correct environment has been a primary struggle. How do we get the right versions of the right operating system and applications, supported by sufficient processor power, RAM and bandwidth to all the people who need to learn this tech – ***and make sure it works***? Over the years, technological innovations such as imaging software, virtual machines and the work done by lab hosting providers like Skillable have improved the situation considerably. But our focus on hands-on labs may have leaned toward prioritizing the design of "labs that work" over "labs that teach." There is more on this subject in the last section of this document.

Linda Pavian Roberts' research (among others) has shown that "the capacity of learners to be autonomous" and learn by experiencing real-world scenarios relates to "the degree of the learner's responsibilities for her actions in learning and tackling tasks in the context of the workplace." Roberts further points out that "adult learners need to learn in a real-world environment to believe" there are realistic consequences to "owning" these new skills. This type of experiential learning establishes relevance at both the conscious and sub-conscious level.[2]

"What did I just do. Why did I do it?"

We've invested so many resources to provide learners with accurately-configured-and-working environments. But are we missing the mark in terms of providing hands-on experiences that are central to the overall learner journey? Are we missing opportunities to provide better learning with hands-on labs? Are we designing and delivering hands-on learning experiences that build new skills or are we leaning on traditional methodologies for knowledge transfer (i.e., "tell me, show me, let me"), and then providing labs to check a box? Perhaps the real question should be whether learners become more confident and job-ready if they are asked to resolve real-world challenges in real-world software environments designed to help them figure things out on their own, fail forward and get scored on their performance?

Learning experiences are minimally effective when people are asked to simply repeat the steps they were taught. Being asked to "Listen to me, watch me, then follow the steps outlined in this book" often doesn't result in learners knowing what they just did or why. "Show and tell" simply isn't enough. At their core, labs that ask learners to "type this and click that" are lessons in how to follow a recipe.

To be effective in today's software environment, learners must be given an orientation to a toolset, then turned loose to apply those tools to resolve a manageable problem, achieve a result and be validated based on the outcomes of their activities.

"When should I do it in my job?" Adults need relevant learning experiences

Adult learners must be placed in real-world situations for learning experiences to have the relevance necessary to achieve optimum knowledge acquisition. Murdoch University professor Cassandra Berry describes a creative, problem-based learning approach using a motivational "island crisis" scenario to inspire research and exploration of biological interactions.[3]

While developing training, whether in application software, operating systems or even Virtual Reality, Authentic Testing Corp. infuses job-relevant content as part of the learning or testing context. It answers an implicit question all learners have: "Why do I need to learn this?" When a learner can see the utility of the skills being taught, the learner recognizes that mastery will be useful in their near future. For example, an instruction like, ***"Give Janet access to the foo database"*** provides less context for when and why the learner will need to use this skill than, ***"Give Janet appropriate access to the Sales Orders database so she can run revenue reports."*** Just a few words can have an impact.

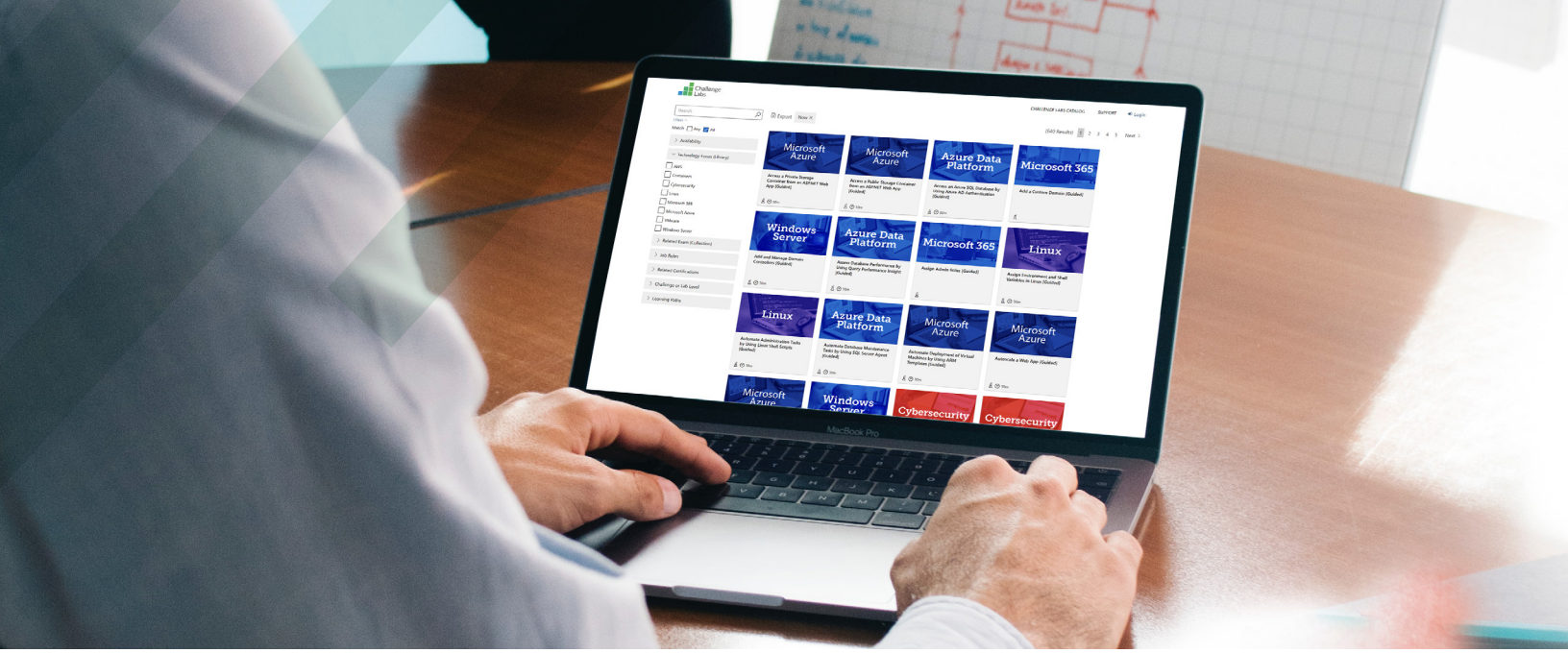
Ruth Clark (2016) also amplifies the benefits of Scenario Based Learning in using a series of digital, authentic tasks to initiate lessons and to serve as the engine for learning: "This design approach enhances critical thinking and problem-solving skills."[4]

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Challenge-centric learning addresses shortcomings of traditional training

As an industry, training plays a strategic role for every other industry. While the realities of the pandemic certainly made live and recorded online instruction more commonplace, in many ways these modalities remain very similar to the virtual classrooms of the late 1990s and early 2000s. While not meant to be exhaustive, the following list outlines key shortcomings of the training space.

Shortcoming	Description
Learner engagement	Learners are increasingly addicted to short-term involvement. Most every form of content, from streaming video to enticing news snippets and Facebook posts have contributed to this reality. Consequently, many learners have developed study habits incompatible with lengthy learning treatments. Hands-on labs using challenge-centric learning are typically short (15-20 minutes) and engaging, leading to attentive learning spans and more focused engagement.
Learner mindset	Some learners are fearful of going beyond the bounds of instruction. They don't want to be embarrassed by failure or by doing the wrong thing. Learning activities that challenge learners often help them overcome this fear by encouraging them to try alternative solutions.
Problem-solving activities	When online training is used as part of the hiring process, asking a candidate to apply new skills in a different context at the end of a lab encourages problem-solving skills beyond straightforward application of the software skills discovered in the lesson. Will Carson, Director of Content for Cybrary, says "...Challenge Labs from Skillable provide open-ended tasks. A lab that tells you exactly what to do isn't particularly helpful once you get into the real world. Leadership doesn't say, 'Here's the objective and here's how to accomplish it.'" Learning how to solve a problem you've never seen by "just figuring it out" is high-value skillset.[5]
Skill abstraction and application (transfer)	When learners can abstract a newly acquired skill by applying it to a different scenario, the connection naturally increases the confidence that they "own" the new skill.
Reading comprehension	Because challenge-centric learning experiences are focused and minimize didactic instruction, they are comprised of low reading level instructions and relatively few words. This helps level the playing field for learners with a different primary language and can decrease overall localization costs.



Early evidence for hands-on and challenge-centric learning

Since the late 1970s, countries have invested countless numbers of hours researching and explaining the realities of "The Global Skills Gap." Not only can hands-on challenge-centric learning experiences decrease overall training budgets, but evidence shows they better engage new learners and help qualified learners hone and/or expand their skills more quickly. It is estimated that a global tech talent shortage of 85.2 million people will materialize by 2030, costing the world economy an estimated $8.45 trillion in unrealized annual revenue. Clearly, there are too few qualified people available to fill high-tech and other key positions in our global society. More effective means of advancing learning are essential to our advancement worldwide.[6]

At Authentic Testing, we believe in challenge-centric learning because we've done the research and have seen the results. In 1984, we developed the FastStart series, a set of instructions for learners to follow as they mastered specific applications. While we were pleased with the results, within a few years we realized we could present the same problems without instructions, as a test, and ask candidates to just do the task. When we observed many students could accurately complete the test without the instructions by "connecting the dots" of the user experience, we launched the Judd Test Series, which was distributed by Prentice Hall as a test that validated learners as they did the work.

The research and success of the Judd Test Series ultimately led to another product. The PinPoint Series was designed to abbreviate training by using methods that still validated the learner. With PinPoint, the candidate was given a series of tasks to accomplish. As the candidate successfully completed one task, the program automatically moved to the next task. If the learner slowed down and likely needed help, the program provided hints or illustrations showing how to solve the problem, then presented the learner with another similar problem. PinPoint minimized training time because it didn't attempt to teach learners what they could figure out on their own. This entire training series was later acquired by Microsoft and became the foundation of the MOUSE training programs, which were used by more than 16 million users to master Microsoft Office applications.

Essentially, our research and testing products were validating that users had mastery of skills such as building a database or creating a PivotTable by measuring the result of what they produced in a "real-world" environment. We proved that "learn while doing" works in terms of helping people develop skill mastery and validating those skills as the learner made progress. It's rewarding to see companies like Skillable demonstrating this principle at scale with its Challenge Labs.

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Hands-on learning designed as rote learning experiences miss the mark

Our original findings still apply today: When you tell learners exactly where to click, what to type and what to do, rote learning occurs. Sure, the student can repeat the steps, but typically will not use the opportunity to actually think through the skills required to solve the problem. In the rote learning model, the learner doesn't have to initiate action to apply the tools. This approach often minimizes knowledge transfer and retention in adult learners, who need to think, imagine, create and try new ways to solve problems and develop skills that can be effectively transferred to their job.

Challenging learners to perform tasks without help sparks neural connections

Providing hands-on learning experiences designed to encourage learners to explore the interface, try new things, make mistakes and ultimately accomplish a task is the most effective way to engage learners with software.

Soon, hands-on learning experiences will better track learner attentiveness through integrated eye-tracking measurement software and response-latency measures. The data we gather from this sort of telemetry will show instructional designers what physiologically engages learners so better content can be developed – or even served in real-time – for that learner. Notice I started the paragraph focused on "hands-on learning experiences" and how we will engage learners. Not how we will ***teach*** learners, but how we will ***engage*** them. Words like ***train*** and ***teach*** imply an outside agent is going to take at least partial responsibility for ensuring knowledge transfer occurs. Hands-on labs that challenge learners to explore and "figure it out" place all the responsibility on the person who needs to develop skill mastery with your software. How does this work?

Learning *while* doing

From a theoretical perspective, this concept relates well with John Dewey's "learn by doing" principle, a foundational tenet of educational psychology. Adult learners will learn more at a faster pace if they're able to work through situations and figure things out on their own. Exploring and discovery are part of the larger learning process. As such, good instructional designers know they can't do for the learner. The learner alone must initiate action. The trick is to design activities that cause the learner to act on content, which will spark feedback (both positive and negative reinforcement). When learners act, essential neural connections are made, and real learning occurs.[7]

When a learner is simply following directions, he or she is simply transcribing a dictation someone else originated. In that case, the mental focus is on transcribing accurately. When the learner must initiate action with a wide variety of options available, the learner not only must evaluate the action's effectiveness but must also consider the variety of available actions. David Kolb, founder of the modern theory of experiential learning, describes the importance of a reflection process in defining experiential learning.[8]

For many instructional modalities, the problem is scaling the feedback. An individual instructor can work with a student and provide appropriate feedback. Ergo "coaching" is highly valued and apprentice programs work. The problem faced by the learning industry is how to scale feedback productively to large numbers of learners. A lecture, demo or stream video can reach a massive audience simultaneously, but without individual active engagement and feedback, learning may be fleeting, if at all.

Desirable difficulties and flexible work styles

Robert and Elizabeth Bjork discuss the role of "desirable difficulties" that create initial challenges, but then benefit the learner with better transfer and retention.[9, 15] Adult learners need to "get stuck" in a safe environment where they are forced to figure it out, make mistakes and fail forward. John Maxwell says, "Fail early, fail often but always fail forward" in describing the need to create a culture free of the fear of failure to provide learners an environment that promotes technological innovation, calculated risk taking and quality of life.[10]

Nick Thompson, the Director of Leadership and Employee Engagement at Engage, points to the opportunity for IT leaders shift to a "more sophisticated form of management" by embracing flexible work styles and focusing on outcomes rather than on hours or forcing people down a specific path. Challenge-centric learning encourages people to develop the mindset and skills necessary to figure out higher level problems.[11]

Challenge Labs: A practical example of challenge-centric learning

Over the years, Authentic Testing has worked with scores of instructional designers and subject matter experts (SMEs) to create hundreds of learning experiences. At a high-level, the trick is to find a set of guidelines that will govern how teams build consistent, high-quality content to the standards deemed necessary. If the desire is to build learning experiences that are challenge-centric, it's important to start the transition by first following a set of principles. What follows is a set of recommendations based on the Challenge Labs product from Skillable. Take this set of guidelines and shape them to best suit your own organization's needs.

Principle	Purpose and/or desired outcome
Content validation	The foundation of validation is that success in the lab predicts success on the job. There are two ways to establish this: **The easy way** (which is somewhat subjective) Get a group of SMEs together and have them define tasks which frequently occur on the job. This set of tasks can be validated by a survey of practitioners rating the frequency of these tasks on their jobs. **The hard way** (which takes longer but is objective) Perform a legitimate job/task analysis by monitoring on-the-job performance and statistically evaluating the frequency, importance and complexity of various tasks.
Learn while doing	Always keep in mind that the learner's core motivation is to own the challenge and solve it. Design activities that force the learner to "grab the mouse" or engage in the actual activity they're being asked to learn.
Scenario-based	Create scenarios that force learners to visualize themselves in a role where they must use these new skills in a setting where something is at stake. Situations where "good things" happen if they're successful (positive reinforcement) or "bad things" happen if they're not (negative reinforcement) can both be used. The situations used should be immediately recognizable and relevant to the learner (e.g., provide intrinsic motivation to complete the task and remember the solution), engage the learner and be at the appropriate skill level to stretch the learners' capabilities.
Paradigms	In formulating a lab, authors should select examples that are paradigms for other applications. By using paradigms, learners can more easily extend new skills to other contexts. Essentially, the scenario forms a sort of pattern so that learning one element enables the learner to quickly apply that skill to other areas. For example, once a learner understands how to bold a font, it's very likely he "knows" how to change its color, underline, italicize and change the font altogether.
"Long rope"	Accept the learner's initial attempts. Track progress through the challenge without providing guidance too quickly. See if the learner discovers a new solution not envisioned by the designers. Learners are presented with opportunities to fail forward when they have a chance to explore. Their opportunities to advance are limited by inflexible recipes that can be learned today and forgotten tomorrow.

Challenge Labs: A practical example of challenge-centric learning

(Continued)

Principle	Purpose and/or desired outcome
Telemetry considerations	Track and store as much data as possible as the learner progresses through the challenge. Design all learning in "segments," evaluate learner progress as each segment is completed and provide appropriate remediation as necessary and appropriate. Congratulate when appropriate. Most importantly, generate step-by-step validation and congratulate the learner after they complete each segment successfully.
Lab sequencing	Sequencing of the labs within a series and the tasks within each individual lab should be logical. For example, in the context of learning data types in programming, initial types would be Boolean, text, number and date. Only after learning what these are can the learner see the utility of the variant type, which allows the data type to be unknown to the programmer.
Encourage efficiency	Monitor the efficiency of the learner's solution. If other alternatives might be more efficient, offer the learner opportunities to try different solutions
Self-efficacy	Lab authors should recognize that increasing learner confidence and self-efficacy is a core tenet of challenge-centric learning. When learners are dependent on their own capabilities vs. simply following directions from someone else, they will have more trust in themselves. In his Social Learning Theory, Albert Bandura describes "self-efficacy" as "Judgements about how well one can organize and execute courses of action required to deal with prospective situations that contain many ambiguous, unpredictable, and often stressful, elements.[12] Mintzes points to hands-on science activities as promoting self-efficacy in learning.[13]
Real-world rules apply	Every challenge-based learning experience must provide learners the opportunity to use the actual environment they would use in the real world, without any simulations if possible. Additionally, since technologists must be good researchers, the use of online help and other resources should be considered "in bounds" for any learning experience that is not high stakes.
Score-able	In designing challenge-based learning experiences, it's essential to consider how to "score" the lab. It should be clear that scoring will be based on outcomes, e.g., the results of the learner's performance. But determining how to do that scoring can be tricky as, depending on the skill level of the lab, you will want to show learners how they did and provide remediation for certain activities or tasks. For example, if the challenge is to sort a list, make sure the full list can't be seen so the learner can't visually verify the accuracy of the sort.
Capstones	Design a summary activity, or "Capstone," that lets the learner demonstrate mastery of several related skills and extend the learning beyond the initial problem set.

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As an example, Challenge Labs present learners with a scenario where they need to complete a real-world set of tasks. To accomplish the feat, the experience provides them virtual unfettered access to the actual software in cloud environments like AWS or Microsoft Azure, or access to a virtual machine (VM) running an application. In these scenarios the learners are provided with straightforward tasks to complete.

In contrast, traditional technology training typically emphasizes trainer explanation ("tell") then trainer demo ("show") for the instructional components of a course, while the labs provide rote practice. The following examples illustrate the difference:

Sample instruction "traditional" lab	Sample instruction "challenge-centric" lab
You're setting up a computer for a new team member who lives in Chicago, IL. **This lab will enable you to set a time zone.** • From the [Start] menu, click Settings • Double-click [Time & Language] • Uncheck the "Set time zone automatically" check box • Click the option under "Time Zone," scroll to find the correct time zone, and click it. • Click "Adjust for daylight savings time automatically" to turn it "on."	You're setting up a computer for a new team member who lives in Chicago, IL. Set the time zone effectively for this user.

Challenge Labs present learners with a software problem relevant to the learner's abilities and interest, a morsel instead of a meal. Learners may get a brief introduction to the tools necessary to meet the challenge presented, but for the most part they're unleashed on the problem. If they get stuck and can't proceed, automated prompts, videos or suggestions give them a clue.

Challenge-centric learning encourages learners to explore different solutions – even after they've succeeded. The integrated instructions guide the learner to look for faster, easier ways to solve problems. When designed appropriately, learners will want to try another challenge to prove they're capable of resolving next-level problems.

Challenge Labs: Shifting to a challenge-centric learning experience design process

At first glance, even the most savvy learning organization may underestimate the downstream implications of shifting to a learning methodology that leverages hands-on experiences as the core of learning. What Authentic Testing found with Skillable is that every role in the content development engine must re-think the creation of learning experiences. This section outlines the learning development lifecycle they use to ensure they're creating consistency with this new challenge-centric modality.

Challenge Labs: Shifting to a challenge-centric learning experience design process

(Continued)



1. Determine and define
Like all good instructional design, Challenge Labs lean heavily on solid, well-defined learning objectives and clear methods to assess knowledge transfer.

2. Criterion and environment setting
With challenge-centric learning, the SME, or "Lab Author," typically plays a key role in this phase. Typically, they install appropriate applications, set up environment configurations and design methods to "score" the lab based on the learner's results. Lab authors working with the Skillable platform have multiple tools and built-in automation that provide more advanced capabilities in this phase. Considerations include provisioning cloud resources or VMs, starting up necessary software, assigning user permissions and applying specific configurations, data sets and templates.

3. Draft instructions and remediation
Over the last couple years, we've learned that having strong technical writing and editing resources can have a dramatic impact on this section, from the perspective of both quality of final product and overall time to market. This phase includes all writing of instructions for each segment of the lab, helpful hints or guidance, including timing and how learners will access these forms for help and remediation. People with strong instructional design backgrounds are integral to crafting solid remediation and guidance based on "sequencing," which will be explained in the next section.

4. Enable the environment and telemetry
Essentially, this phase describes the notion of enabling the tracking and storing of user data so the appropriate telemetry can be gathered when learners start using the labs and the general process that "publishes" the labs to the destination where learners consume learning (i.e., LMS).

5. Evaluate results and expand challenge
This phase describes both the experience of the individual learner as well as the process of maintaining and improving the lab over time. As individuals go through the lab, the platform consistently assesses their performance based on the outcomes of what they do and the pace at which they're doing it. As they do more, the platform serves up different scenarios to either provide supporting knowledge or introduce new skills.

Challenge Labs: Components of learner tasks

As learners consume more and more content, the consistency of experience from lab to lab becomes more important. As learners anticipate the structure of the learning experience, sometimes subconsciously, if certain elements are missing it can become a negative distraction.

The following elements are what lab developers consider in constructing every lab.

Element	Purpose and/or desired outcome
1. Prepare and picture	• Write a scenario that ensures relevancy for the learner. What is the purpose of the lab? Why learn these skills at all? • Help learners develop a mental model of their role in creating the finished product • Write the guidance for each "task" in ways that encourage learners to conceptualize the problem from different viewpoints
2. Configure and complete	• Provide the instructions/guidance that enable learners to know what they need to complete and verify their results as they go • Depending on the desired skill level for the lab, consider whether to show results as learners complete each task or wait until the end of the lab
3. Assist and assess	• Determine methods to assist learners when they get stuck so that they don't travel too far down the wrong path. Examples of these methods include hints, clues, links to online resources and more directive instructions • Determine how to provide remediation when learners complete a sequence of tasks incorrectly • Surface lower-level tasks to bolster weak areas or higher-level tasks if the learner has proven mastery in a certain area
4. Abstract and apply	• Determine methods to help the learner abstract newly-learned skills and apply them to other scenarios and contexts • Consider new paradigms that enable learners to transfer skills
5. Evaluate and expand	• Depending on the desired skill level for the lab, consider whether to employ task-level scoring or one score for the entire lab • Based on performance, recommend the next set of labs the learner should consider • Recommendations may go beyond the immediate application and expose the learner to different technologies that align their newly validated skills

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Delivering challenge-centric learning: Beyond instructional design methodology

Skillable believes learners are ready for a hands-on revolution. We at Authentic Testing agree that many organizations lean heavily on "labs that work" vs. "labs that teach." Our hope is that we've helped prove that point to you in this white paper. So now what?

Like so many other technology decisions, your organization needs to weigh the overall costs of "build vs. buy." Essentially, your process should start with these two questions:

- **How will you provide "labs that work" to your learners?** Do you have a partner that's scaling with you or should you build out the people, processes and technology yourself?
- **Should you shift toward a "labs that teach" approach?** Are you convinced that challenge-centric learning is worth more exploration?

Our position on both questions should be obvious. Delivering labs that work requires a mature and proven platform. Our strong recommendation would be exhausting every partner option before trying to build something yourself.

Choosing a "full stack" lab platform partner

When it comes to designing, developing, delivering then maintaining hands-on labs, there are so many components to consider. As you evaluate potential partners, the following checklists may help you sketch out the right high-level plan to deliver hands-on learning experiences at scale.

Element	Management and reporting	Building and delivering	Scaling and flexibility
Capabilities	• Is there a robust suite of well-documented APIs? • What kind of data can they produce – and is it accessible via API? • Can they demo a good lab reporting experience on a third-party LMS? • If you need an LMS, do they have one?	• Is there support for all the environments you need (cloud, VM, containers, coding, data science, etc.)? • Can their platform automatically score a lab based on the results produced by the learner? • Can you self-publish labs you create, or must you lean on the partner's publishing processes? • Do they have expertise in challenge-centric learning?	• Have they delivered labs reliably to every global region you plan to serve? • Do they have off-the-shelf labs you can license for less than building yourself? • Do they have built-in processes that protect you from potential cloud over-billing or security holes? • Can they ensure a consistent user experience for all learners?
Services	• Do they have proven expertise implementing and maintaining LTI integrations?	• Do they have custom content teams staffed by instructional designers and lab developers who can help build content if you need it? • Do they have teams that know how to write good assessments such as multiple choice and Performance-based Testing?	• Do they have the engineering expertise to build out highly secure, highly custom and highly available environments? • Do they have established partnerships with multiple enterprise customers?

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