How to Incorporate **Learning Science** into Your Work

The Learning Guild

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INTRODUCTION

There is a growing body of research on learning science, however sifting through all the articles and reports to track down which scientific applications might be relevant and useful to your practice can be time consuming.

In this eBook industry experts come to the rescue, providing practical tips on how you can effectively leverage learning science to create more impactful learning experiences.

Evidence shows that building solutions that are grounded in science may prove helpful in enhancing learning outcomes. Use these suggestions to improve your practice and results.

POPULAR MYTHS AND MISCONCEPTIONS

JANE BOZARTH

I occasionally produce reports taking on ideas and, well, myths, popular in L&D conversations. As often as not, a deep dive into these topics exposes flaws and misconceptions. In reporting findings that may challenge the past practice of our members I always try to offer some tips for applying the new information, often in the form of "what to do instead" suggestions. Full text of these reports is available for free (with a free Learning Guild membership) at www.learningguild.com.

Learning Styles

While people may have preferences as to the types of instructional material they find useful (although research shows they may not always be right), there is scant evidence showing that matching instruction to preferences results in positive learning outcomes. Research shows that matching the instructional approach to content will result in better outcomes than trying to tailor to some concept of "style": students in a science class will be better served by a good lab experiment than pictures of that experiment; an anatomy textbook needs pictures. (For that matter, research on the picture superiority effect tells us that pictures are almost always better than text in supporting recall and retrieval of information.) Leveraging our understanding of proven approaches—such as distributed practice and application of proven principles of multimedia design—will ultimately matter more than attempting to cater to a nebulous idea of "learning style".

Source material: The Truth About Teaching to Learning Styles and What to Do Instead

Personality Type Inventories

The problems with personality type instruments are extensive, starting with the challenge of trying to capture the intricacies of humans in a few questions. There are also issues with self-reporting, with either/or responses to questionnaire items, with results being misused, with nebulous predictive value, with lack of regard for socioeconomic factors... the list goes on and on. Some researchers feel more attention should be turned to thinking styles, proposing that these uniquely contribute to career decision-making self-efficacy beyond personality traits, and that the malleability of thinking styles and personality traits differ. Others suggest time should be spent better defining job performance criteria. They note that the changing workplace, now with more service jobs and team-based work, is ripe for a fresh investigation. By way of example, they call for the development of new criteria that capture performance-related behavior in emerging aspects of the workplace, such as teamwork in virtual teams. Finally, others suggest that we shift focus from personality assessment altogether, noting that tests of ability are easier to construct, are more valid and reliable, and are more likely to predict job performance than any test of personality.

Source material: Personality Inventories: Fiction, Fact, Future

Generations

When I embarked on the reading needed for this research report I expected to find lots of HR data showing grievances and workplace conflicts related to generational issues. I found none. I did find very little agreement about what constituted a "generation" and a good deal of talk about differences but very little deals with outcomes (Is one generation more productive? Does one make more errors than another?) There's also considerable talk in the literature about there being very little "there" there: this is a popular topic but there is little to support changing management practices and training approaches based on some conception of "generation"

Some ‘what to do instead” ideas:

- Workers want similar things regardless of their age, particularly in regard to supervisors and managers who are open to ideas, who listen, who are accessible, who offer mentoring and coaching, and who show care and concern. L&D should work toward developing such supervisors.

- As with the information on learning styles, those creating instructional materials and experiences should focus on what is appropriate for the content, not on trying to cater to some preconceived generational notion of preference.

- Watch your language: The Baby Boomer interested in “career advancement” and the GenZ-er interested in “lifelong learning” may be talking about very similar things.

- Check your own biases: Experimental research showed that trainer stereotypes of learners based on age created a self-fulfilling prophecy. Because of an expectation that older workers would have a harder time learning, they were provided with lower-quality training.

Source material: More Similar Than Different: What the Research Says about Generations in the Workplace.

Director of Research
The Learning Guild

Jane Bozarth, the director of research for The Learning Guild, is a veteran classroom trainer who transitioned to eLearning in the late 1990s and has never looked back. In her previous job as leader of the State of North Carolina’s award-winning eLearning program, Jane specialized in finding low-cost ways of providing online training solutions. She is the author of several books, including *eLearning Solutions on a Shoestring*, *Social Media for Trainers*, and *Show Your Work: The Payoffs and How-To’s of Working Out Loud*. Jane holds a doctorate in training and development and was awarded the Guild Master Award in 2013 for her accomplishments and contributions to the eLearning community.

‘EVERY SYSTEM IS PERFECTLY DESIGNED TO GET THE RESULTS IT GETS’

JULIE DIRKSEN

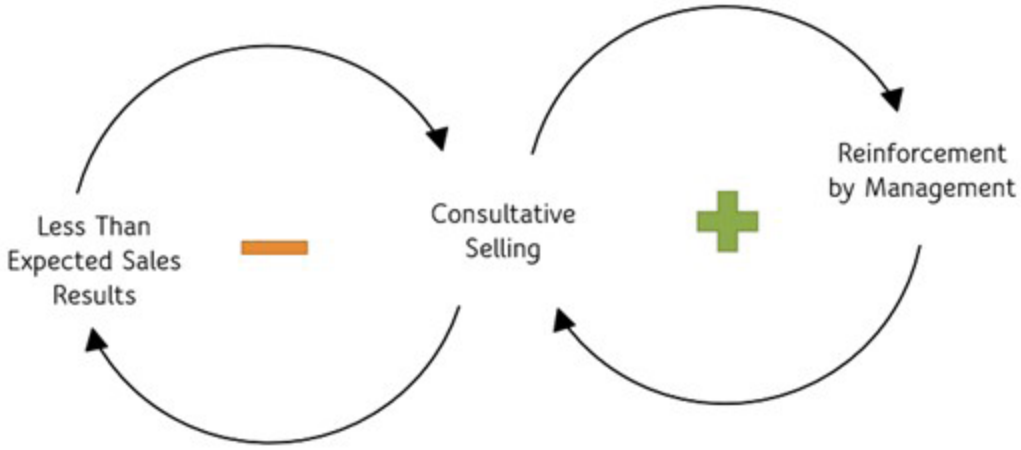
Tip 1: Consider the design of the system

There’s a quote that is attributed to W. Edwards Deming that says, “Every system is perfectly designed to get the results it gets.“

If a system is producing undesirable results—for example a high level of safety incidents in a warehouse, or poor compliance with new guidelines for patient treatment in a hospital, or poor uptake of a new software system in a corporation—it’s worth asking, “What about the design of the current system is causing this result?”

All too often, stakeholders are inclined to blame employees for being lazy or careless but something about how the system is constructed is fostering the outcome. It could be the amount of time employees have to learn new processes, or a lack of follow up, or some managers paying only lip service to the new system because they are also too busy to support it.

Peter Senge, in his classic book *The Fifth Discipline*, encourages mapping the system dynamics to understand what is creating the outcomes. For example, many sales organizations are trying to move from product-based selling to consultative selling, but often salespeople experience a dip in their sales figures when they switch from tried-and-true methods so even if management supports the new sales model, sales employees may feel discouraged.



Training can help this scenario but other measures are likely necessary, such as coaching employees through the sales dip, adjusting sales expectations while the new methods are being rolled out, or involving employees in the planning process so they know what to expect.

Tip 2: Consider where feedback/outcomes become visible

When creating training on a new behavior or action for individual employees, it's worth asking, "Where does the feedback for the new behavior become visible?" Feedback on a behavior may become visible at the individual level, group level, or system level.

For example:

Individual level feedback could be something like individual sales numbers. If you train salespeople on a new product, you can typically track sales numbers for that product for each individual salesperson. Those numbers can be then aggregated at the group and system level.

Group level feedback could be something like the impact of handwashing protocols in a clinic or hospital. If a patient or a group of patients get preventable infections, it's very difficult to track that to a particular individual. The outcome only becomes visible at the group (patient infection(s)) or system level (infection rates in comparison to similar facilities).

System level feedback could be something like pay disparity based on race or gender. Individual salary decisions may seem justifiable based on multiple tangible and intangible factors, or on negotiation interactions, or because of the tradition of basing salary offers on previous wages (which compounds inequalities over time), but it can be very difficult to see at an individual or even group level. Often the disparities only become visible at an aggregate system level.

This is important to look at because it can be very difficult to change group or system level problems by focusing solely on individual behaviors. In most cases, individual interventions may be part of the solution, but are unlikely to change things without interventions and monitoring at the group or system level. For example, individual managers may try very hard to not let bias affect their hiring or salary offers, but they often don't have the necessary information to ensure that they are being effective without guidance at the group or system level. Training can help in these scenarios but will likely fail if other systems aren't in place to support changes.

Tip 3: Consider all the types of interventions

It can be useful to use different lenses to look at a change. Training could be an answer, but are there other strategies that could be more effective?

In Dr. Susan Michie et al.'s model, The Behaviour Change Wheel, many different interventions are considered. In addition to training and education, the model also considers:

- **Modeling:** Can participants see the new behavior modeled for them? Are opinion-leaders providing visible examples of the new behavior?
- **Environmental Restructuring:** Is there anything about the environment or the system that could support the new behavior?
- **Enablement:** Are there any supports that would help? Additional coaching? More time?

- **Restriction:** Do we need to restrict access to something to support the behavior, e.g., limiting access to or turning off the old system to encourage uptake of the new system?
- **Coercion:** Are penalties required?
- **Incentivisation:** Would rewards for the new behavior support uptake?
- **Persuasion:** Would strategies that are more focused on marketing or persuasion be helpful?

Often the belief is that these other interventions are not options for the challenges presented to L&D groups but it's always worth asking how each of these are currently being used, or if there are helpful strategies that could be feasible.

Learning Strategist
Usable Learning

Julie Dirksen, a learning strategist with Usable Learning, is a consultant and instructional designer with more than 15 years' experience creating highly interactive eLearning experiences for clients ranging from Fortune 500 companies to technology startups to grant-funded research initiatives. She's interested in using neuroscience, change management, and persuasive technology to promote sustainable long-term learning and behavior change. Her MS degree in instructional systems technology is from Indiana University, and she's been an adjunct faculty member at the Minneapolis College of Art and Design. She is the author of *Design For How People Learn.*

BETTER VISUAL DESIGN PRACTICE

SARAH MERCIER

Here are two visual design tips that learning professionals can use immediately to apply user interface (UI) and user experience (UX) research in their work.

Tip 1: Leverage *design affordances*—visuals and functionality already familiar to learners—to improve the elearning user experience (UX).

Jakob's Law states that users prefer that sites function in the same way as others they already know. As you design, use visuals that are widely recognized and require no additional explanation.

For example, even if a learner has never seen a floppy disk in real life before, they automatically know that selecting a button with the floppy disk icon means "save."

Floppy disks
Image by rawpixel.com

Save icon

When you tap into existing mental models, you enable your learners to focus on the instructional objectives. Don't make them use their precious time and energy trying to figure out how to interact with your elearning.

If individuals are having trouble navigating your elearning, avoid attempting to explain why you built it that way and creating detailed navigation instructions. This is your cue to rethink the interface design!

When you use design affordances, you're far less likely to need labels for your navigational elements. Your learner will already know what to do based on previous experience.

Tip 2: Make important information or action items visually distinctive.

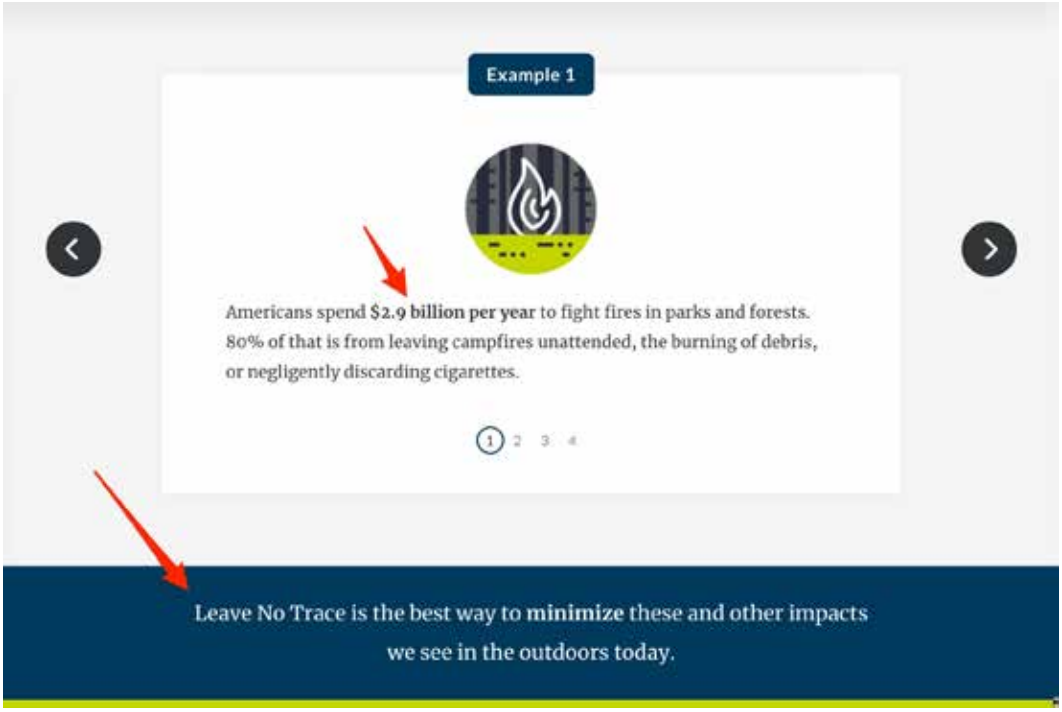
There are three UI/UX laws that you can use to call attention to important information for your learners:

1. Von Restorff Effect
2. Law of Proximity
3. Law of Common Region

The Von Restorff Effect (also known as The Isolation Effect) states that when multiple similar objects are present, the one that is different will most likely be remembered. To support your learner in retaining key points or a call-to-action, use visual elements to set that information apart.

Here are two simple examples:

- Apply a different color or style to the text
- Use a highlight or callout box

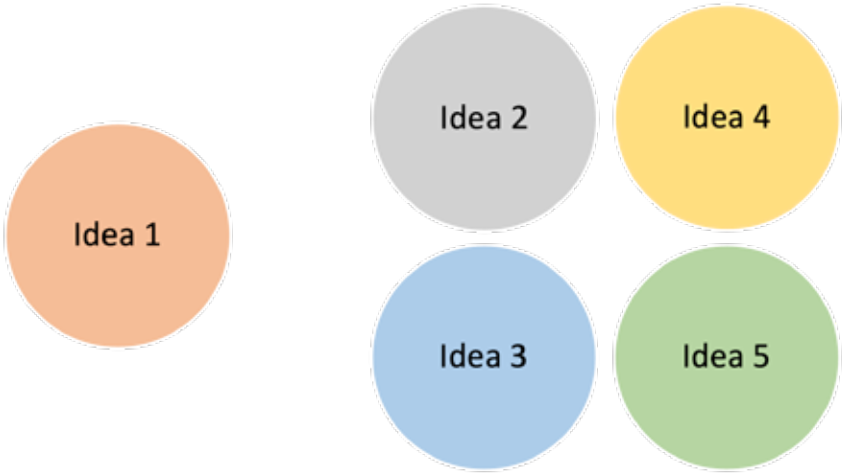


https://lnt.org/get-involved/training-courses/online-awareness-course/

The Von Restorff Effect only works if you have been consistent with the style of other content and elements present—if everything is different, then you won't be able to set the key information apart. Be sure to check for accessible color and contrast. The WebAIM contrast checker is a great free tool to use.

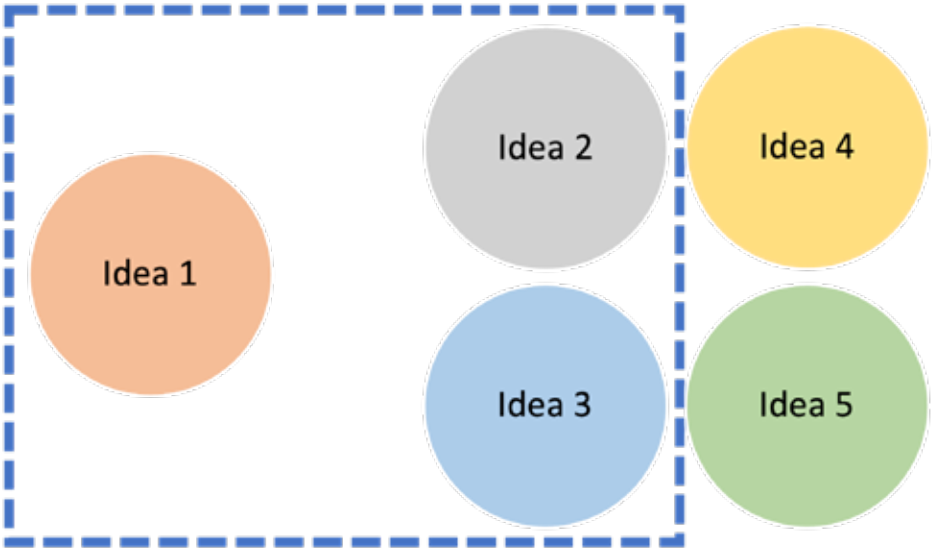
The Law of Proximity states that when objects are close to each other, we perceive that they are grouped together. In practice, you can use white space to create clear, consistent structure and grouping.

In the example on the next page, I used proximity to create a grouping of ideas 2-5 and white space to separate idea 1, making it visually distinctive.



The Law of Common Region is another way to create grouping by using shared boundaries to create clear, consistent structure and grouping. Regardless of proximity, you can use common region to show that elements belong together.

In the example below, I added grouping to ideas 1-3 by adding a boundary. Now ideas 4 and 5 are separated from the group. However, notice how proximity still plays a role within the boundary. Ideas 2 and 3 are perceived to be grouped together and white space calls attention to idea 1.



Although all the laws may seem obvious, designers can unknowingly convey meaning that doesn't exist with poor formatting choices, alignment that's slightly off, or content that is oddly close together.

You can improve your visual design now by using design affordances and applying UI/UX laws to make more intentional design choices!

CEO
Learning Ninjas

Sarah Mercier, CEO at Learning Ninjas, specializes in innovative learning technology and strategic implementation of learning solutions. Sarah is an international facilitator for the Association for Talent Development's E-Learning Instructional Design and Microlearning certificate programs. She is a frequent speaker at industry conferences and business events in the areas of instructional strategy, learning technology strategy, and learning solution design and development. Her work has been published in ATD's *2020 Trends in Learning Technology*, *The Book of Road-Tested Activities*, *TD Magazine*, *Learning Solutions Magazine*, *CLO Magazine*, and a variety of other training and workforce publications.

UNDERSTAND HOW RESEARCH FINDINGS APPLY TO OUR SET OF NEEDS

MATTHEW PIERCE

For many of us, the idea of learning science can feel intimidating or complicated. While it may sometimes be the case, I have found that taking time to read and critically think about what is being presented is key.

For learning science research and reports on mediums like video, we need to consider not only what outcome the data seems to be presenting, but the context of the study we're examining, before applying it to our own work and circumstances.

For instance, I recently saw a company quoting a research study that looked at how long students spent watching videos in Massively Open Online Courses (MOOCs). While they were citing their sources and trying to apply the research, the circumstances of the research and how they were presenting using video were vastly different. The organization was applying the findings to all videos in all circumstances, while the research focused on a unique set of parameters. We have to be careful to understand how research findings may or may not apply to our set of needs and circumstances.

Context matters. Circumstances of research can have a major impact on the understanding of the application of the data. As consumers of learning science, we should not only be mindful of experimental setup and application to broad swaths of our work. Best practices can and do emerge, but there are many other variables that may impact what and how we should apply them.

This is not said to discount learning science, which needs to continue and be furthered, but simply to state that research results cannot always be applied directly to the courses, lessons, training, etc. that we may create. We need to be willing to take in the ideas and experiment based on our situations and circumstances.

Learning & Video Ambassador
TechSmith

Matthew Pierce is a video creator, podcast host, and instructional designer who loves to share his knowledge, experience, and expertise. As learning & video ambassador for TechSmith, he hosts The Visual Lounge podcast, leads the TechSmith Academy, and launched the Camtasia Certification program. He's led training, customer education, and has been in roles related to video and brand awareness. He is a regular speaker and contributor to learning and development, customer education, and marketing events and conferences.

UNDERSTAND WHAT LEARNERS NEED TO DO, NOT KNOW

CLARK QUINN

What differentiates most learning from what learning science would suggest? A number of years ago now, I colluded with colleagues Michael Allen, Julie Dirksen, and Will Thalheimer on the Serious eLearning Manifesto. That effort talked about eight ways in which we thought traditional elearning differed from what learning science would suggest. Thus, here, I want to take a slightly different cut through the same content, focusing on learner experience this time.

In my book on learning science, I suggest that our goals for learning are retention over time until needed, and transfer from the learning environment to all appropriate situations (and no inappropriate ones). If there are aren't sufficient opportunities for practice, it's unlikely the learning will be around when needed. If there's insufficient breadth of practice, there's unlikely to be sufficient transfer.

So then, what is appropriate practice? What matters most is what the learner *does*. Not what they've read, heard, or seen, but what actions they've undertaken! There are things that they will need to read, hear, and see, but the biggest determinant of successful performance is performing in the learning experience as you'll perform *after* the learning experience.

This means truly understanding what learners need to do, not know. Which requires ensuring that the problem is indeed a skills gap, and that the required new behavior is adequately specified. Then, align the practice with that need, and resource the learning experience with the minimum necessary resources to succeed. By emphasizing minimalism, we also ensure that materials have precise definitions.

There are many entailments to this. Feedback on performance is critical to optimal benefits from the investments in creating the learning experience. Also, space the learning over time; to use a metaphor, our brains require rest and then more practice, just as muscle development does. The contexts seen, across examples and practice, determine transfer. Also, showing worked examples before learners attempt practice improves outcomes. These nuances aren't too onerous, and are necessary for success.

One determinant that has increasingly been realized in research is the importance of emotion in learning. In my most recent book, on the topic of engagement, I suggest that initially being motivated to learn matters, as does maintaining that commitment through the experience. Guide the learners to understand why the learning is important. Then, maintain curiosity and an appropriate level of challenge in practice. Make the learning experience safe, so that it's okay to make mistakes. Humor, properly used, plays a role, helping make the learning feel safe and addressing tension as well.

Overall, learning science provides a guide to answer questions and avoid myths about what to do to design, deliver, and evaluate learning. While it's dynamic, the basics are well-established enough to provide a firm foundation. I believe it's a professional prerogative to understand enough to avoid common mistakes. We are responsible to raise our practice to the necessary standards. Let's practice what we preach.

Executive Director
Quinnovation

Clark Quinn, PhD provides strategic learning technology solutions to corporations, government, not-for-profits, and education organizations. An internationally known consultant, speaker, and author of seven books, as well as numerous articles and chapters, he integrates a deep understanding of thinking and learning with broad experience in technology to improve organizational execution, innovation, and ultimately performance. In 2012, Clark was recognized as the Learning Guild's first Guild Master. He thinks 'out loud' at learnlets.com, tweets as @quinnovator, and works on behalf of clients through Quinnovation.

MODELING CAN BE YOUR SECRET WEAPON

KRISTIN TORRENCE

As someone who became an "Accidental Instructional Designer" by way of cognitive science research, learning science has been at the core of my learning design philosophy and frames my perspective on learning design. I'm happy to share with you my top two tips for incorporating learning science into your practice.

Tip 1: Ground learning design in what we know to be true about how people learn and the conditions that contribute to effective learning.

Kick off the learning design process with intention and ground it in learning science research. Equip yourself with knowledge of learning theories and instructional methods to frame your design approach. Translate cognitive psychology and neuroscience research into practice when making design decisions to promote encoding into long-term memory and transfer, managing cognitive load, and providing appropriate scaffolding.

When ideating about how you will design your learning experience, identify the conditions and limitations you must design for, and then consider what the literature suggests about learning within these parameters. If the objective of your learning solution is to achieve mastery, then you might consider drawing insights from mastery-based learning. If you're confined to a game medium, you would turn to game-based learning research. Ensure you approach this discovery with a holistic view, expanding your considerations beyond technology and implementation affordances by also considering mindset and motivational factors, environmental (e.g., formal or informal contexts), and social constructs that may be at play, and use these learnings to inform your design decisions.

Tip 2: Use models as blueprints that set the foundation for learning design decisions.

When designing for disciplinary learning, modeling can be your secret weapon in many ways. Associative facet modeling such as domain modeling and competency modeling can help define the scope and clarify the granularities of a given domain. With competency modeling, being able to clearly depict how competencies are operationalized into subconstructs and map their interrelations helps designers identify all relevant facets that can be intentionally designed for and measured as performance indicators.

Task modeling can help to expedite the design of various learning activities by defining the specifications for tasks, which essentially provides a blueprint for learning activity design. Task modeling provides guardrails for strategically designing tasks that solicit empirical evidence of target competency facets that are within a competency model. This practice helps to ensure that your learning design solicits the right behaviors that produce quality performance data.

Used in conjunction with competency modeling and task modeling, learner modeling makes it easier for designers to make inferences about learners' knowledge or proficiency levels based on performance metrics. These insights can then inform the types of tasks to provide the learner with the appropriate level of difficulty for continued skill development. This is particularly helpful when building adaptive solutions.

These models were discussed in greater detail in my Evidence-Centered Design for Virtual Reality Training presentation at the Learning Science in the Real World Online Conference, which took place in April, 2022.

Head of Learning Engineering
Talespin

Kristin Torrence serves as the Head of Learning Engineering at Talespin, where she focuses on applying learning sciences, instructional design, and data science practices to design, instrument, and validate XR learning solutions. Her background is in cognitive science, game-based learning, and instructional design and she is particularly interested in the intersection of learning science, XR, and learning analytics. She received a graduate degree in Cognitive Studies in Education with a concentration in Intelligent Technologies from the Teacher's College of Columbia University. She co-founded XR in LXD, a meetup and community of practice for IDs/LXDs interested in designing XR, and she is an active member of XR Women and the IEEE Industry Consortium on Learning Engineering (ICICLE) Design SIG and Tools SIG.