



Good Simulation Design

More and more companies are integrating simulations into their e-learning, enabling learners to practice applying the concepts being taught in real-world situations. This is particularly true in “soft” skill areas, such as sales, coaching, and leadership.

Different developers have taken different approaches in building simulations to teach soft skills. Some incorporate virtual worlds and avatars in order to capture the maximum amount of realism. Others have gone to the other extreme, building simulations where users are given a small set of choices and, if they choose incorrectly, they’re corrected and sent back to do it over. Some developers are experimenting with natural language interfaces, eschewing choice sets in favor of requiring users to generate their own actions. Still others use branching video, where learners watch actors perform role-play based on choices they make, turning the user into a director, in effect.



Which of these approaches is best? And are the cost of each justified by its learning benefit?

It’s an interesting debate. To answer these questions, you need to ask “How does learning happen?” It’s also important to ask “How much learning should I expect from simulations?” Or from another perspective, “How much should I have to spend on a simulation to cover my subject matter effectively?”

Learning Design

The consensus among cognitive scientists, brain researchers, and educators is that people learn best in the context of performing real-world activity—trying things out, making mistakes, and correcting their performance as they go. We can’t master a skill without being able to experiment with applying it. Just as none of us learned to ride a bike by reading a manual, we didn’t learn how to do our jobs from a lecture or a new hire orientation.





We learned it by working through it, making mistakes as we went. We're all adept at gleaning feedback from our environment that guides us on how to do it better the next time. A well-designed simulation gives us the opportunity to make the mistakes we might make in real life, for the same reasons. It also allows us to see the consequences of those mistakes, so we can correct our mental model of how to act in a given situation.

Another important component of how we learn is that the past colors everything we do. When we're presented with a new situation, we scan our memories for "scripts" of how we worked through similar situations, which we use to shape our reasoning. When these scripts fail, we modify them to match the new situation, which we continue to do until we succeed. This means that an effective simulation must mimic the real world in a way that enables us to recall the appropriate scripts and to apply them.

We also want to make sure that the simulation gets used. There's not much value in something that no one uses. So, a simulation must be engaging enough to draw learners through it.

How Much Realism?

It is important for a simulation to provide context around the knowledge and skills being demonstrated. Most of us learned that we can turn our bicycle sharply to the left at slow speeds, but not when we're going fast. Same skill – different context, well learned after the first mistake.



But where does "context" end and "distraction" begin? Do we need to include a bike horn to learn how to turn? Do we need to practice bike-turning on different kinds of bikes? What about different colors of bikes?

The short answer is, *if something contributes to meaningful mistakes, simulate it; otherwise, leave it out.* For example, in a sales simulation, does having a desk and a phone in the interface add to learning? It would be if they somehow contribute to user mistakes – for example, if users sometimes say the wrong thing because they're fumbling with the phone. A good designer should evaluate every element in the simulated world: if he/she can't come up with interesting mistakes regarding it, it should be yanked. .

Virtual worlds and avatars may let learners experience the context more fully and better sense the consequences of their actions—if they've made the customer angry, for example, there's nothing like experiencing this in living color. If not done well, however, such props can actually lessen learning. They may cause the learner to focus on superfluous elements in the



simulated world, instead of the matters at hand. In a sales simulation, for example, working the phone or engaging in a long conversation with a co-worker are probably not the skills you are looking to hone, so such props simply add noise to the experience. The same goes for animations. A certain amount of “eye candy” can be engaging, but too much becomes distracting and detracts from the effectiveness of the product.

Video can be entertaining. It is certainly easy to watch. But if learners are doing more watching than acting, the benefits of learning by doing disappear.

Furthermore, even if a high degree of realism is achieved, the effort can be wasted if it does not ring true to the learner. If the activities the learner is engaged in and the language being used in the interaction do not match up with the learners’ job context, the transfer of those skills to the job becomes less direct. Realistic worlds that are not customized to the learners’ situation begin to lose their effectiveness.

At What Cost?

Given a finite budget, the big question is, where do you spend your money to gain maximum effectiveness? Do you want the developers spending their time making expensive virtual worlds, videos, and animations? They will be engaging, but you may have to sacrifice areas like breadth of subject matter and customization to your company. Or is it more important for your e-learning developers to spend their time crafting customized learner

experiences rich in opportunities for trial and error?



For example, you can spend \$Y and get an off-the-shelf simulation with 10 situations that cover wireless phone sales for some fictional company, complete with video and animations. If you want it customized to your company; rewritten to include your products, your terminology, your customer interactions and then re-shot and re-animated, you could be waiting for many months and spend double \$Y.

Alternatively, you can spend that \$Y to get an off-the-shelf simulation with just 3 situations covering e-Commerce sales, but offering a natural-language interface. Building the grammars that enable the system to successfully recognize an acceptable number of possible learner utterances can be time consuming and expensive, so you must limit the breadth of the interaction for a given budget. If you want a more realistic interaction, if you want to customize the interaction to your company, or if you want to cover broader subject matter, you could be waiting months and spend far more than double \$Y.



Or, you can opt for using the off-the-shelf simulation products as they are. Learners will probably have some difficulty translating all the skills learned in the simulated interactions to their daily lives, so learning effectiveness would be lost. The ROI of the learning investment would plummet.

Finally, you can choose to forego (for now) some of the things that drive up cost, like extensive video and natural language interfaces. You can concentrate instead on spending your \$Y to create perhaps 15-20 situations specifically for your organization, that reflect your interactions and cover the subjects you want to cover.

The balanced compromise would be to make the interactions engaging *enough* for learners that they will complete them, and at the same time insert enough opportunities to see the consequences of mistakes committed or actions omitted, all within the budget constraint.

Learning Execution

Achieving this balance between engaging content, customization, and the depth and breadth of learning impact is tricky.



Experience Builders believes that customized interactions, providing learners the opportunity to pursue strategies as they would in their actual roles, are the highest and best use of simulation budgets. The learner should be acting in the role rather than watching the role play. This requires the learner to think about the simulation in the same way he/she thinks about the job, and also heightens the engagement.

In most domains, each interaction should be ten or fifteen minutes in length, in order to keep the learner engaged through the end, and to allow the user time to reflect on his/her performance. At each turn, the gamut of plausible strategies should be represented without redundancy. In other words, the learner should be able to follow the strategy of his choice without the system getting confused as to what strategy he is following at any given time. For this reason we have found it much more cost-effective to offer users a fixed set of choices than to build a natural language front-end, which requires a fairly extensive investment in an underlying content representation, and which can enable the learner to get off-track.

There should be subtle feedback to tell the learner how he is doing. Coaching or tutoring should be focused on the suboptimal decisions made by the learner. When the learner does not make a suboptimal choice, his attention should not be distracted by feedback. To tap into his/her ability to self-correct, the primary feedback that the learner gets should be from the character interaction in the simulation, which



can be not-so-subtle. Tutoring and other feedback should be subordinate to the character interaction.

When the learner makes a nonfatal mistake, there should be a chance to recover and keep moving forward in the interaction. Simply stating that the choice was wrong and requiring the learner to “do over” is not even close to realistic.

A goal setting and scorekeeping mechanism should exist within the simulation. At the end of each interaction the learner should be able to look back over his performance and reflect on the goals won and lost.

Executing these designs achieves the best balance of learning effectiveness and cost. Adding multimedia elements and natural language interfaces can marginally enhance these designs, but today they enhance cost more than learning effectiveness.