Why use simulations in training?

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Well-designed learning simulations provide engaging and effective learning experiences, whether in-person or in e-learning. Simulations are uniquely suited for performance improvement because they invoke thinking and require learners to make decisions and perform actions. In addition, they also provide a space where learners can practice a new skill and make mistakes without real-life consequences. This in turn, increases their confidence in using a new skill and facilitates its transfer to the real-world. Simulations provide the following benefits:

a. Enhance safety - In a simulation, we can do something dangerous without experiencing the consequences. We can learn how to issue warnings for life-threatening events without the actual threat of anyone dying.
b. Provide experiences not readily available in reality - We can create a simulation about a past event and ask learners to take on different roles.
c. Modify time frames - In a study of movement of glaciers, simulations can compress years or centuries into minutes. Or if we study rapid atmospheric events, we can slow down time.
d. Make rare events more common - People in areas where phenomena such as hurricanes/typhoons are rare can learn about them in simulations.
e. Control complexity of the learning situation - In a forecasting simulation, we can control how much data is available for analysis. For a beginner, the amount of data can be limited to the most relevant. For an expert, a full suite of data can be made available, providing more decision-making opportunities.

What is a simulation?

There are many different types of simulations. Alessi and Trollip (2001) offer this discussion: "An educational simulation can be defined as a model of some phenomenon or activity that users learn about through interaction with the simulation." For example, when deciding what weather warning to issue, forecasters need to determine if the impacts will exceed a certain threshold and what is the probability that will happen, then they decide on the most appropriate message to send.

"A simulation doesn't just replicate a phenomenon, it also simplifies it by omitting, changing, or adding details or features. This is a critical point." [*For an example, see the Substance Abuse section in this simulation: https://sales.alleni.com/MISC/CorningSE/training1.html Username: tourbypass Password:123456 Flash required.*]

To create a learning simulation, we need to identify an underlying model of what we intend to simulate. If a person knows that model they can move through the simulation rapidly and complete it successfully. Those that do not know the underlying model need to move through the simulation several times until they find out what it is and learn how to use it.

Here is an example: To successfully communicate a forecast, one needs to address the concerns of the group they are trying to reach, avoid using complex meteorological terminology and be brief. This is the underlying model. So if a learner creates a forecast message that fails to address the audience's concerns, the learner will fail. If a learner addresses the concerns but also uses a lot of meteorological terminology, the learner will fail. If a forecast message addresses the concerns and is free of terminology but takes 15 minutes to communicate, the learner will fail. This type of a simulation is also called a branching simulation. The user takes different paths and fails until they find out the correct path. The learner will fail until they take the correct actions in the right sequence.

Broadly speaking there are four types of actions within simulations: "choices to make, objects to manipulate, events to react to, and systems to investigate. Each has its own associated user action. They are, respectively, making a choice, manipulating an object, reacting to an event, and collecting information…Increasingly, most of these actions are made with the mouse, which can be used to select among multiple-choice options, drag sliders, click on buttons, or arrange objects on the screen. "(Alessi and Trollip, 2002)

In addition to simplifying, educational simulations can also add elements to guide the learner. These might take the form of coaching advice, feedback to actions taken, or hints. These can make the experience easier for novices, and also enhance learning, [*For an example, see "Short Order Chef" http://zebr.as/1KJiQWw Flash required.*]

Feedback

Feedback in simulations is a balancing act between providing enough information to aid learning and too much information that might reduce active engagement. It requires more careful consideration.

Natural feedback indicates a problem without giving a solution. The learner has to think about another solution until they figure it out. This is how real life works. In the real world if we fly a small airplane in a cloud and become lost, there is no feedback to tell us that there is a mountain in front of us. The natural feedback, if we make a misjudgment, is that we will crash into the mountain. On the other hand, novices to a field may struggle with this type of feedback because they feel that they are not learning quickly enough or are being punished unjustly.

Artificial feedback is a message that says: "There are mountains ahead." Artificial feedback helps people avoid errors and reduces their frustration with the new content. So people new to a field prefer this feedback. However, it is a balance. Current research suggests that giving learners a challenging problem and having them make mistakes improves learning outcomes. Seeing the question and then seeing the answer is not enough. The learners need to actively engage the problem. (Quinn, 2018) While people new to a field may prefer artificial feedback, studies show that they learn more from natural feedback.

Timing of feedback

Immediate feedback in the case of the airplane simulation is text that tells the learner they need to turn back as soon as the visibility becomes low. Delayed feedback is to let them crash into a mountain. Natural feedback is usually delayed because it happens some time after the initial action that caused it. The learner discovers the consequences after some time has passed. This is OK, because sometimes reality gives us no feedback at all.

Research suggests that learners like immediate, artificial feedback because they get to figure things out quicker. But other research suggests that by struggling to figure things out through natural feedback, learners learn to make better choices, remember information longer and transfer it to their work. A suggestion is to give novice learners immediate feedback and advanced learners natural, delayed feedback. In a series of simulations, immediate feedback can slowly be reduced.

Exercise

Visit the MetEd module, Levering Social Science To Improve Risk Communications and complete the Simulation section. (You may need to create an account, which will take just a few moments.) While engaging with the simulation, answer the following questions:

What type of actions do the learners take in the simulation?

What is the underlying model?

What are the decisions that learners need to make in the simulation?

Based on the decisions you were asked to make, what is the underlying model of the simulation?

What type of feedback was given to the learners, artificial or natural?

Was the feedback delayed or immediate?

References

Alessi, S., & Trollip, S., (2001). Multimedia for Learning, Methods and Development. Needham Heights, MA: Allyn & Bacon.
Kapp, Karl, (2012). The Gamification of Learning and Instruction, John Wiley & Sons, Inc.
Quinn, Clark, (2018.) Millennials, Goldfish and other training misconceptions, ATD Press, Danvers, MA.