

## What is a simulation?

A simulation is a computer application that replicates a process and is designed for classroom instruction, either in a traditional face-to-face classroom, a computer lab setting, or in an online environment. A simulation is:

- **Interactive:** It requires active participation by the user. Its purpose is to teach by helping the user replicate and participate in a process--the user is not simply receiving information passively. The user introduces information that actually contributes to the creation of the process.
- **Nonlinear:** There are multiple, perhaps infinite, paths that a user could initiate. The simulation reacts to the user's input, rather than following a preprogrammed agenda.
- **Complex:** More than one interaction is required to consider an application to be a simulation.

[Click here to try a simulation](#)

## How would I use simulations?

Potential objectives of using simulations in teaching are:

- **To supplement instruction:** In an ideal world, faculty would have unlimited time and resources to dedicate to teaching, and every discussion group and lab would be perfectly planned and exquisitely executed. In the real world, demands on the teaching force render this impractical. A simulation allows something difficult to be programmed once and then used unlimited times by unlimited students.
- **To facilitate learning:** A simulation allows students to access a process as many times as they like, at their own speed, and at their own convenience, without worrying about limiting issues such as conflicting timetables or expense of materials. In addition, simulations are particularly good at developing many critical skills (for example, hypothesis testing) that can be difficult to acquire using traditional methods.

## Why would I use simulations?

Simulations make it possible for students to participate in, and learn from, processes that might otherwise be less available due to various considerations.

- **Danger:** anything that explodes or involves large projectiles; anything requiring reactive chemicals; exothermic reactions; simulations about radiation or acid rain. These things can all be studied safely with simulations.
- **Expense:** chemistry experiments involving very expensive materials such as diamond, uranium 235; anthropology simulations that allow the user to travel to another country and interact with its culture.
- **Ethical considerations:** cloning; any kind of experiment on the human body (and for many people, on animals too); extant simulations include a frog dissection simulation kit and a root canal simulation for dentistry students.
- **Abstract nature of the material:** economic phenomena (e.g. how inflation works, or the stock market); processes or phenomena that are difficult to see and so require a mental picture: thermodynamics, orbitals, how gasses occupy physical space.

- **Other logistical difficulties:** subatomic processes that are impossible to see in real life; processes that require expanding or compressing time (evolution, glacier movement).

Note that there is overlap between categories (for example, things that are dangerous are often expensive as well).

### **What are some possible limitations to using simulations?**

- Simulations have not proven fruitful for most idea-based courses (for example philosophy, literature).
- Finding exactly what you're looking for can be difficult, especially if you have very rigid preconceptions of what you want the simulation to do.
- You need to ensure that all students have adequate access to computers and/or computer labs that are properly equipped to run the simulations.

### **Where can I find simulations to use?**

Simulations come on CD-ROMs that can either be purchased separately or come with a textbook. They are also available on the Internet. Two major repositories are:

- [Merlot](#). From the home page, you can either search for specific simulations, or you can browse by subjects, such as Business or Mathematics.
- [EOE Foundation](#). When you get to the home page, click the graphic under "Visit the Educational Object Economy!" Then click the "Learning Objects" links at the top left. Next, click a topic you are interested in, then try a simulation.

### **Are there any other practical considerations?**

Of course, try to keep the following in mind:

- Determine whether using simulations is optional or required for your students. If required, make sure students have access to computers and the Internet. Since many simulations are run through a web browser, students need to use a web browser with Java capabilities (most relatively current browsers have this).
- Design a lesson around the simulation that meets your objectives.
- If you are going to assess students on what they learn from the simulation, let them know in advance, and match your test or quiz questions to your objectives.
- You can put your assignment or any other information regarding the simulation on your web site so students will always be able to find it. From a web page, you can easily link to the simulation.
- If you are in a traditional classroom, you can use the simulation in ways other than just having students work one-on-one with it at a computer. You can project it onto a large screen, and complete a lesson as a class. You can also show the simulation to illuminate a concept or other information in a lecture.
- Use your creativity. There are probably many more ways you can use simulations.