

7 things you should know about Augmented Reality

Scenario

Last week, Josie missed a field trip that her botany class took to the Botanical Garden. Today, using a technique called augmented reality, she's going to make up that field trip on her own using a guided tour that the TA created to help her understand the material the class covered. The midterm is coming up, and Josie will need to identify key species in each of nine ecosystems modeled in the garden.

Josie heads to the Botanical Garden with her PDA. Starting from the main gate, she faces east and observes a striking cedar, in front of which is a sign that tells her the tree is more than 500 years old. Josie plugs in her headphones and selects a recording of the professor giving his theory about the role that trees like this one play in the ecosystem. As she approaches the cedar, the GPS in her PDA notes her location and makes the appropriate files available. Browsing through the notes associated with her current GPS coordinates, Josie discovers that a classmate has decided to do his term project on the skunks making their home in the tree. She also learns from a previous year's student project that the skunks living in the tree displaced a young raccoon. As she moves through the garden, she selects photos and movies of other trees, depicting the history of the garden, seasonal differences, and changes that have occurred.

In addition to the material supplied by the TA, Josie is able to download the notes, photos, and keywords that the rest of her class recorded when they took the field trip. She adds her own observations, assigning appropriate keywords so others can find them easily. She also makes sure to include GPS coordinates. When she is finished with the project, she will include it in her public record to share with her little brother back home. She plans to bring him to the garden when he visits at Thanksgiving.

After finishing the field trip, Josie feels ready for the midterm. She found studying in the outdoors to be invigorating, and she is confident that the GPS and Wi-Fi technology combined with the course material as well as her colleagues' comments and completed assignments have given her the understanding she needs to do well.

What is it?

The goal of augmented reality is to add information and meaning to a real object or place. Unlike virtual reality, augmented reality does not create a simulation of reality. Instead, it takes a real object or space as the foundation and incorporates technologies that add contextual data to deepen a person's understanding of the subject. For example, by superimposing imaging data from an MRI onto a patient's body, augmented reality can help a surgeon pinpoint a tumor that is to be removed. In this case, the technology used might include headgear worn by the surgeon combined with a computer interface that maps data to the person lying on the operating table. In other cases, augmented reality might add audio commentary, location data, historical context, or other forms of content that can make a user's experience of a thing or a place more meaningful.

Who's doing it?

Augmented reality has been put to use in a number of fields, including medical imaging, where doctors can access data about patients; aviation, where tools show pilots important data about the landscape they are viewing; training, in which technology provides students or technicians with necessary data about specific objects they are working with; and in museums, where artifacts can be tagged with information such as the artifact's historical context or where it was discovered.

Within the academy, educators are beginning to provide students with deeper, more meaningful experiences by linking educational content with specific places and objects. In many disciplines, field trips are part of the course; by supplementing these explorations with mobile technologies and data-collection devices (including digital cameras), the lessons can be extended beyond the field trip. In some cases, augmented reality technologies have been integrated into educational games. In MIT's *Environmental Detectives*, for example, students learn about environmental sciences and ecosystems by finding clues and solving a mystery on the MIT campus using PDAs fitted with GPS devices.

[more](#) ⇨

How does it work?

A range of technologies can be used for augmented reality. Many augmented reality projects use headgear or a similar device that projects data into the user's field of vision, corresponding with a real object or space the user is observing. In the case of a technical course on PC maintenance, for example, augmented reality might overlay a schematic diagram onto the inside of a computer, allowing students to identify the various components and access technical specifications about them. PDAs or other portable devices can use GPS data to provide users with context—including visual, audio, or text-based data—about real objects or places. Augmented reality is not merely a companion text or multimedia file but a technology designed to “see” a real object or place and provide the user with appropriate information at the right time. Augmented reality is designed to blur the line between the reality the user is experiencing and the content provided by technology.

Why is it significant?

Because every object or place has a history and a context, making that content available to individuals interacting with those places or things provides a richer experience. To the extent that instructors can furnish students with a broad context for understanding the real world, students are more likely to comprehend what they are learning and to remember it later. Information can also come from students themselves. Students in an archeology class might use an augmented reality system to capture their thoughts or impressions when working with artifacts. That content can then be made available to others during subsequent lab sessions, allowing them to have a deeper understanding of the subject matter and a richer learning experience. Augmented reality might also make higher education and specialized content more accessible to the general public, transporting lessons from the campus to the community.

What are the downsides?

Many augmented reality projects rely on specific or customized hardware, and the mechanisms that correlate data added by technology with the real world are often technically complex. Despite falling costs for hardware overall, augmented reality projects can be expensive to develop and maintain.

Today's augmented reality projects typically focus on individual users and may not lend themselves to team activities or group learning. In addition, augmented reality projects may resemble entertainment, raising questions about their pedagogical value. Educators must be careful to ensure that activities have educational merit and that students do not become infatuated with the technology alone.

Where is it going?

Computing devices, especially wireless ones, are becoming more powerful and increasingly widespread. At the same time, costs for these devices are falling. As computing hardware—both wired and wireless—approaches ubiquity, new opportunities emerge to use technology to enrich individuals' experiences of objects and places. Because all areas of academic inquiry benefit from background and context, augmented reality has the possibility of enhancing education across the curriculum. By exposing students to an experiential, explorative, and authentic model of learning early in their higher education careers, augmented reality has the potential to help shift modes of learning from students' simply being recipients of content to their taking an active role in gathering and processing information, thereby creating knowledge.

What are the implications for teaching and learning?

Augmented reality is one way to bring experiential and location-based learning to students by supplementing existing worlds rather than creating new ones. Augmented reality installations can be built to take advantage of existing or low-cost infrastructure. The use of nearly ubiquitous devices such as cell phones may permit rapid experimentation and evolution of augmented reality applications.

By combining technology familiar to students with locations that students see as their own, augmented reality has the potential to move learning out of the classrooms and into the spaces where students live. Encouraging informal learning that is easily accessible may prove particularly effective in engaging students, extending learning to spaces that might help them form connections with content, the locations that provide the context for it, and the peers that they share it with.