7 things you should know about...
Mapping Mashups

Scenario

As part of a large undergraduate history course he teaches about World War II, Dr. Martinez developed a mapping mashup that he introduces to the 150 students at the beginning of the semester. The mashup, which works with Google maps, represents major events leading up to and during the war. Fundamentally, it's a map, he explains, showing them on a projection screen that it works very much like the online mapping tools students regularly use. The map covers virtually the entire globe, and users can move around the world, zooming in and out, showing the area of search as a map, satellite images, or satellite images with maps, dates, and events superimposed.

When students zoom in on Europe, they see flags scattered around the continent and into Asia. Similar maps dot Japan, Southeast Asia, and the South Pacific. When clicked, each flag opens a pop-up box that names the location, explains what happened there and when, and shows a photograph of that site at or close to the date in question. Flags correspond to important battles, political events, treaties that were signed, and cities such as Vichy, the wartime capital of France. The text in the box also includes links to articles that talk in depth about what took place in each location and the significance of that event. Students can zoom in to particular locations and see satellite images of what the place looks like today. They can also get an idea about the terrain where soldiers fought and died.

During lectures, Dr. Martinez encourages students to have the mapping mashup running and use it to see what he is talking about. Answers to many common questions are available through the application, and Dr. Martinez finds over the semester that students are answering many of their own questions—and asking him more thoughtful ones—than in pervious semesters because the maps integrate content and context. Most importantly, he finds that student comprehension is improved, particularly their understanding of the geography of Europe and the growth, and then regression, of the Axis powers.

What is it?

Mashups combine separate, stand-alone technologies into a novel application. Unlike open source software, mashups typically function through an application programming interface (API), which facilitates communication between the technologies without modification of the source code. Mapping mashups interoperate with an online mapping service, such as those developed by Google or Yahoo, combining data with the mapping application's locating service.

Online mapping services allow users to navigate most of the globe through a Web interface, viewing varying levels of resolution through maps, satellite imagery, or a combination. Mapping mashups overlay data on those maps with clickable markers showing specific points of interest. For example, a map at geology.com shows 50 of the most easily discernible craters caused by meteorites. The craters are located on six continents, and users can zoom in and see the name, location, and size of each crater.

Who's doing it?

Quite a few colleges and universities have developed mapping mashups for administrative and informational purposes. A number of institutions offer maps, for example, that display information to new and returning students about available housing. Other applications include tools that show where incoming students are from, offering admissions staff a clear, graphical representation of how well regional recruiting programs are working. Similar applications can show where alumni live or can serve as orientation tools for new students as they familiarize themselves with a campus and its facilities.

Educational applications are starting to emerge as well. Hobart King, professor of geology and geography at Mansfield University in Pennsylvania, has developed a mapping mashup that helps students learn about plate tectonics. Students see a map of the world with "pushpins" indicating locations where evidence of tectonic plates is most apparent. Satellite images show clearly, for example, that the opposite shores of the Red Sea have what King's map calls a "jigsaw puzzle fit," evidence of plates that are diverging. Each pin on the map gives a brief explanation about what students see when they zoom in and out on the maps and move from one site to another.

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How does it work?

Most mapping applications function just as the underlying mapping tools work, with the additional ability to click on markers. The API allows the source-data application and the online map to share longitude and latitude data or address data, accurately locating relevant sites on the mapping service. A database can feed information to a map, as in the case of a housing application, or an instructor can manually locate points of interest and attach markers. Some applications offer markup tools. With these, users can add lines, free-form scribbles, text notes, and other graphical elements to a map.

When users click on a marker, a pop-up window displays information about that location. This information can be text, pictures, audio or video files, or links to other online resources. The pop-up windows can contain static information, such as what an instructor might enter when developing the map, or dynamic information from a database that shows current data.

Why is it significant?

Students today understand online maps—the old joke about properly folding a roadmap applies doubly to people raised with computers, who may never have used a paper map. Mapping mashups are another opportunity to incorporate a technology students already use into education. The interactive nature of such applications appeals to students, who increasingly seek opportunities to take an active role in their learning. Whether navigating the content of a mapping application generated by an instructor or applying their own knowledge to build or contribute to a map project, students enjoy the immediate connection of content with its physical place in the world.

Largely because of the early and frequent use of computers, students increasingly benefit from visual learning, and mapping mashups provide sophisticated yet easy-to-use tools for visualization—tools that clearly show spatial relationships. In many cases, rendering data or concepts in a visual form—as opposed to simple text and numbers—helps users see and understand more thoroughly the material being represented.

What are the downsides?

One drawback of mapping mashups is that they depend on the underlying mapping service. Although the online maps from Google and Yahoo are generally reliable and stable, any application that uses them will stop functioning should the mapping service be interrupted or discontinued. Moreover, the choice of a mapping application may have implications for a mashup built on it. Although Google Maps appears to have spawned more mashups than Yahoo Maps, for example, the two services are not identical. Further, new mapping services are being developed, complicating the selection of an appropriate service.

Another concern with commercial mapping services is that they often focus largely on North America and Europe. The level of detail available for other parts of the world can be spotty, resulting in potential gaps in areas a mashup hopes to cover. Functionally,

many mapping mashups demand considerable bandwidth and, as a result, function poorly over slower connections. Finally, creating mapping mashups is not trivial. Although the concept behind a mashup might be straightforward, making it work properly often requires strong technical skills and a considerable amount of time.

Where is it going?

Mashups built on online maps are proliferating, covering a wide and growing range of topics. Mashups are being developed, for example, that allow users to "geotag" photographs posted on Flickr. As this practice grows, users can start with global coordinates and search the Web for resources—not limited to photos—that have been tagged with those coordinates.

Although maps that show drink specials in New York City or fast-food restaurants across the United States might not seem useful for education, these and other mashups offer researchers and educators new ways of presenting and analyzing data. Even zany mashups might be one creative instructor away from being compelling educational tools. As the features and functionality of the underlying online maps grow, so too do the opportunities for new combinations of data with maps.

What are the implications for teaching and learning?

In many fields of study, an understanding of the geographical context of places and events is central to deep comprehension of the subject matter. This applies to areas ranging from the sciences, such as geology or meteorology, to the humanities, such as history or political science. Joining subject matter to a mapping tool provides an educational experience unlike simply reading about a place and then finding it on a map. Applications can show groups of locations on a map, representing how proximity among the sites, topographical features, or other elements of the physical world bear on the subject at hand. Mapping mashups provide a means for placing data and class lessons into a physical context. For some students, this step moves an otherwise abstract concept into the real world, helping them see patterns and movements that explain ideas and their significance.

By their nature, many mapping mashups are particularly well suited to research. To the extent that such tools accurately model the practices of researchers—manipulating data, thinking critically about patterns and relationships—mapping mashups can bring research closer to teaching and provide authentic experiences to students.

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