Our NSF TUES-sponsored research centers on the role of digital data, visualizations, animations, and simulations in undergraduate geoscience education. Digital devices are revolutionizing field geosciences. GPS, GIS, and GES (Google Earth Science) have truly transformed the way geoscientists teach, learn, and do research.

Whilst Google Earth visualizations are user-friendly for the person browsing, they can be notoriously unfriendly for the content creator. Therefore, we are developing tools to help educators create and share visualizations as easily as if posting on Facebook.

Example: Go to www.DigitalPlanet.org:3000/ Click Tools and API. Here you will find tools to 1) create your own screen overlays, for example for map keys or student quizzes, 2) Create 3D maps symbols that hover over the GE Terrain, 3) move polygons over the Google Earth terrain to simulate thrusting or plate reconstruction, 4) superpose an image of your choice on the GE API, 5) Create custom sliders, and 6) build your own emergent cross sections.

To generate an emergent cross section, you simply go to your location on Google Earth, resize and orient the default cross section ‘billboard,’ enter the URLs of your section graphics files, and specify the vertical range of motion desired. When you are satisfied with your section, you can upload it to our server and share with the world.

A second outcome of our TUES projects merges Second-Life-style interaction with Google Earth. We created games in which students act as first responders for natural hazard mitigation, prospectors for natural resource explorations, and structural geologist for map-making. Students are represented by avatars and collaborate by exchange of text messages – the natural mode of communication for the current generation.

Teachers view logs showing student movements as well as transcripts of text messages and can scaffold student learning and geofence students to prevent wandering. Early results of in-class testing show positive learning outcomes.
We organized a GSA Penrose Conference, an AGU Townhall Meeting, and most recently a GSA Pardee Keynote Symposium called Digital Geology Speed-dating which proved highly popular. As with our students, colleagues learn from direct personal interaction with colleagues.

The web sites www.DigitalPlanet.org and www.DigitalPlanets.org, supported by our TUES grant, have since 2010 received over 2.9 million hits from 54,000 unique users in 18 countries. Each month, we upload a new Google Earth KML, KMZ, or similar resource.

Future plans include development of a ‘Grand Tour’ of places that every geoscience student should visit at least virtually, augmented reality teaching resources, hosting of more community mapping and crowd-sourcing, and creation of a truly 4-D virtual globe spanning geologic time.

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