Innovating Earth Sciences Education With Web Service and Knowledge Management Technologies

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Geospatial data and information and knowledge derived from geospatial data play vital roles in multidisciplinary Earth sciences education and research. In the past several decades, huge amounts of Earth sciences data have been collected mainly through remote sensing. Those data have become the treasure for Earth sciences education and research. Training students how to discover and use the huge volume of Earth sciences data in research become one of the most important trainings for making a student a qualified scientist. Due to the complexities of the Earth science data and computing resources required for using those data, it is always a challenging task for education to provide dynamic data-intensive training to students. In recent years, Web service and knowledge management technologies development enables innovative methods in data publishing, accessing, visualization, analyzing and knowledge building and sharing. Earth sciences have experienced a paradigm shift from having all data and computing resources owned locally to having them shared over the Web. Data providers have made their archival data accessible on-line over the Web via standard or private interfaces. Service-Oriented Architecture (SOA) and the Semantic Web have shown prospects for providing a new standard information infrastructure to enable the discovery, invocation, and assembly of applications and data (Lemmens, 2006).

Being developed by a NASA funded project, the GeoBrain system has adopted and implemented the latest Web services and knowledge management technologies for

innovating Earth science education with cutting-edge capabilities. It provides a data-rich online learning and research environment enabled by wealthy data and information available at NASA Earth Observing System (EOS) Data and Information System (EOSDIS). Students, faculty members, and researchers from institutes worldwide can easily access, analyze, and model with the huge amount of NASA EOS data just like they possess such vast resources locally at their desktops. The online learning and research environment can be used in four major ways: 1) as an unlimited online Earth sciences data resources, 2) as an online data analysis system, 3) as an online platform for geoprocessing modeling, 4) as an online platform for knowledge building and sharing.

Multiple universities have been funded as GeoBrain education partners to explore uses of GeoBrain in the classroom teaching and student research. Their feedbacks are used to guide the development of GeoBrain. Comparisons between traditional uses EOS data and innovative GeoBrain ways in classroom teaching are given for illustrations of the impact of GeoBrain for Earth sciences education.