In just a few short years the internet has gone from having too few sites of interest in science to too many – in both cases it can be difficult to find the information or activity that is needed to learn (or teach) a specific concept. Museum exhibits have gone from “mausoleums” of dusty science artifacts to vibrant, interactive, hands-on, real-time safe sources of up-to-date information and images. Earth Update and Space Update can provide just the starting point for many a lifetime of exploration, and many activities and games along the way to make the journey fun.

The first online interactive realtime computerized exhibit of earth and space science was developed with resources from the Digital Library Technology program: “Space Update”, funded by IITA under the “Public Use of the Internet” program. First on display in late 1994 at the Houston Museum of Natural Science, this software was safer than a browser (since it did not allow unlimited access to the web) but yet allowed one-click updating of earth and space science imagery – views of the sun in various wavelengths, weather maps and NOAA satellite images, etc. Our first module “Shoemaker Levy 9” was on display only 6 weeks after the historic comet hit Jupiter; a full space module opened in October 1994. The earth section “Earth Today” opened in summer of 1995.

Although the software was developed for use as a museum exhibit, many teachers whose classes came through the museum or who participated in our workshops asked for their own copy of the software, and requested that we develop activities to go with the software. Responding to that plea, we created our first “Space Update” disk, called “Connected”, in early 1996.

In 1999, NASA’s first Cooperative Agreement Notice for innovative products in Earth science was released, and we were one of the first awardees for the ESIP (Federation of Earth Science Information Partners). As a part of that project, we developed a separate “Earth Update”
software, a full interactive museum exhibit "Earth Forum" and a series of immersive Earth science shows, including "Powers of Time" (about the cycles of Earth); "Force 5" (about the greatest storms on earth and in space, and "Night of the Titanic", a show that teaches about the conditions on earth and in space that, coupled with human error, caused that tragic sinking. At that time the earth part was removed from Space Update, leaving room to expand Space Update to include a simplified planetarium module plus a "space events" section. Earth Update became its own piece of software, with a consistent look and feel among the Atmosphere, Biosphere, Cryosphere, Geosphere, and Hydrosphere sections.

Space Update is a favorite among museums and schools for its robust design. Its five modules Astronomy, Solar System, Sky Tonight, Space Weather, and Space Events can run as a single linked exhibit, or all except space events can run as a stand-alone exhibit. Space Weather even expanded to become its own CD-rom, with extra activities, movies and sounds highlighting the results from Space Weather missions like IMAGE.

Over 11,000 copies are in the hands of museum and school educators and the public, with the software on permanent display in many fine museums. The software passed the NASA product review, and was recently reviewed in the December 2003 "Sky and Telescope": ... "I was amazed at Space Update's intuitive interface"... "a must-have for science teachers"... "You can bet that Space Update will be on display at our local obseratory and my club's future Astronomy Day activities"...

Earth Update also has an intuitive interface, but is much richer, with information in each "sphere" section about what (is that field of study, e.g. what is the atmosphere); who (studies the atmosphere) how (do they study it) and why (should we care about the atmosphere). Each sphere has a selection of images that update with a single click – for example, weather maps and hurricane tracking maps in atmosphere; bioactivity and greenness maps in biosphere, snow and ice cover maps in cryosphere, volcano and earthquake maps in geosphere, and wave height and water temperature maps in hydrosphere, some of which
are made at Rice directly from the NASA data sets. It also includes a hotlink with each image for more information that launches a browser (that can be disabled for museum use). All images are external for easy use in other purposes.

Activities in Earth Update and Space Update are organized by student grade level and the science standard(s) addressed, and have been used for students from 2nd grade to Reiff's sophomore non-majors solar system classes at Rice University. Earth Update is on display at the Houston Museum of Natural Science in their exhibit called "Earth Forum". That area has twenty-one computers running different sections of the software (and different games included on the CD), plus twelve hand-on physical exhibits. In addition, it has a survey kiosk where the visitors can let us know which parts of the software they enjoy the most, and which might be difficult to use. Over 80 percent "really enjoy" or "enjoy" using the software!

According to the survey, by far the most popular computers in Earth Forum are the ones running "TicTacToe" - a game that lets students test their knowledge about earth against each other or against the computer.

Kids will play for hours, and then complain that they have seen some of the (nearly 600) questions more than once! Many teachers have expressed gratitude at a learning experience they can do with their class that energizes them to have fun. And a question editor is also included, so that teachers can write their own questions or delete questions that their students haven't covered yet. And they can select a subset of the questions to export as a class quiz.

One amazing tool that we have included is a "Data Miner". We call it a game, but it is a very powerful way to map country-based data from the World Resources Institute. With a single click, visitors can create a color map of the countries with the most species, or most endangered species, or most energy use, or highest population, or most ground water use, and then use a mining tool, to get that same data on a per-person, per-area, or even per-automobile basis! The results can be listed by country or by value, and the color bar...
changed or even stretched in case one country's value is far higher than the rest.

So, what can a teacher (AF) who uses Earth Update and Space Update in the classroom say about these teaching tools? Here is her outline:

**Earth Update to Teach Earth Science**
- Helps to increase interest in the Earth Sciences
- Different presentation of information to help stimulate learning – visual and auditory learning styles are used in the text, pictures, and sound bites
- Tic-Tac-Toe game helps make learning fun and enjoyable as well as giving students an opportunity to review material learned
- Real world application to almost all fields of Earth Science
- Real world answers to “Why do we need to know this?”
- Information is linked in relevant ways to help create the schema needed to retain knowledge
- Helps at-risk students receive the same background and prior knowledge that more affluent students get through text as well as video
- Updatable information gives students a sense of ownership to the event

**Space Update to Teach Space Science**
- Making the study of space science more “real” for the students by using real images
- Giving many graphic examples for hard to understand concepts to help make information understandable to many different age groups
- Again the variety of presentation types helps reach all learners
- Real world applications to “Why do we need to know this?”
- Giving students new and interesting career ideas

**Activities**
- Gives relevant application of information presented in Earth/Space Update
- Shows how information would be used in the “real world”

In Ms. Furitsch’s classroom, the most exciting and most rewarding result of using new technology is to turn on the students who are just "marking time" through science. She has several examples of students who routinely failed science very six weeks, who are now actively engaged and considering a science career, coming back to her with their new knowledge of science even after they have gone on to high school. It is examples like those that keep us making interactive exhibits that are educational and fun.

For more info: [http://earth.rice.edu](http://earth.rice.edu)

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