## Bursting the Bandwidth Barrier

An interview with Ray Thomas, University of Florida, Gainesville, FL by Gina Maranto

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Back in the late 1980s, Ray Thomas of the University of Florida says, "The word 'systems', as in Earth system science, scared people"--the particular people in question here being undergraduates at UF. They envisioned "huge amounts of math," and headed the opposite direction. Funded with the first group of ESSE schools, UF's pioneering Geology 1073, An Introduction to Global Change, "mitigated" that fear by taking students online to tap into remote sensing data and carry out simple computer modeling.

"Once we had helped them overcome that psychological barrier, we drew in students who were more self-motivated and intrigued by the hands-on aspects of ESS," says Thomas.

But primitive technology and the relative newness of the internet meant that students still were not hooking into the exciting data that was by then pouring in, beamed down in daily gigabyte feeds to computers all over the world. The whole first class session of 1073, Thomas says, was devoted to helping students get onto the ESSE website. Slow computer lines dictated what sorts of files classes could work with, and still images, much less dynamic models, were off limits.

At the time, UF was using GEOSCOPE, a CD-ROM software program that matched 150 remote sensing data sets with maps and socio-economic data. Developed by the Canadian Space Agency, the program was expensive—about $750 Canadian per machine—so the UF faculty were, says Thomas, “motivated to develop our own content.” (One example is a module on El Niño-Southern Oscillation, available at http://ess.geology.ufl.edu/usra_esse/el_nino.html.)

Today, high-speed connections enable UF ESS instructors to upload video and audio clips, as well as to engage students in advanced learning through STELLA and other modeling software. The 1073 course website is packed with links to data sets and image files, like those available through the Global Land Cover Characteristics Database, and to tools such as the Global Production Efficiency Model. Too, there are links to ESS websites at other schools.

Online labs for 1073 are designed to lead even non-science majors through a range of modeling exercises, leading to a "grand finale" in which students combine models for population growth, the carbon cycle, and Earth energy balance "to examine the effect of

future population growth and CO2 emissions on global mean temperature."

Thomas says that much of what has been done in terms of curriculum has been driven by what has been happening with technology over the last 15 years. But UF's overarching goal has been to draw students into advanced study of ESS by emphasizing the long-term relevance to society of better understanding interactions of the atmosphere, hydrosphere, biosphere, and geosphere. So Thomas and his colleagues have also, since receiving ESSE funding, worked to develop upper level courses that ask students to tackle real world problems by applying their basic knowledge and engaging in more sophisticated modeling.

More information on Geology 1073 can be found at:
http://ess.geology.ufl.edu/

ESS at the University of Florida
http://esse21.usra.edu/ESSE21/esseI_florida.html