

## **The Business of Developing Earth System Science Education**

Owen E. Thompson, University of Maryland, College Park, MD

*The creation and evolution of this ESSE stimulated course development caught the attention of other faculty*

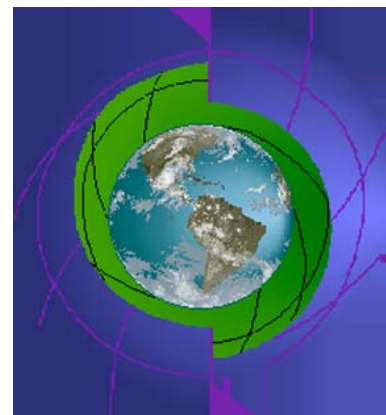


Upon being selected as an ESSE II program participant in 1995, the University of Maryland, College Park, commenced its effort to establish Earth System Science Education for its undergraduate students. Our proposal for the ESSE Program was conceived in a meeting of three departmental administrators, Robert Hudson, who was chair of Meteorology (now known as Atmospheric and Oceanic Science), John Townshend, chair of Geography, and Michael Brown, chair of Geology. I was present, too, in the role of eager faculty member.

As we thought about developing Earth System Science Education—and in particular, about putting together an entry-level course for first-year students—we established additional partnerships with two other campus groups: the Department of Plant Biology; and our Center for Environmental Science and Policy. This led to the first key feature of our educational development effort, namely, establishing educational partnerships with experts from the fields of meteorology, oceanography, geology, geography, plant biology, and environmental policy and law.

Upon that rich intellectual partnership—and with the labor of an interdisciplinary faculty team that devised, organized, and presented class lessons—we built the opening version of a new course meant to expose students to Earth system science during their earliest collegiate moments. The goal was to fix global awareness in their minds at an early stage, with the hope that it would serve as a reference point as they proceeded through their selected college majors. The intellectual aspects of the course evolved over about five years, as we presented subjects, and delved into the systemic interactions among them, and tested students to assess how the message was getting through.

At the same time, although we didn't have the goal of establishing a new ESS major, we undertook some strategic steps to ensure that we would be able to continue offering our course. First, we examined the requirements and electives of various majors to see if our new ESS course might be approved as a requirement, or focused elective, within a given departmental degree plan. As a result, we succeeded in having our course added to several existing degree programs. In addition, we looked closely at the campus course requirements to see if our ESS course might fit into that picture, too. Our campus requirements of all



undergraduate students include “core” courses in “physical science.” At the time, the options were introductory Physics, Astronomy, and Geology courses. A formal proposal was submitted to the Undergraduate Studies program requesting review and approval of our new, cross-listed ESS course—METO/GEOL/GEOG/PBIO 123—“Causes and Implications of Global Change” as an official “Physical Science Core Course.” Within a year of review and evaluation, the campus committee approved our proposal. This “core” status worked to our advantage in increasing and stabilizing student enrollment demand.

One other strategic act enhanced student interest in our ESS course. An independent effort had established another university course “highlight” program, then called “World Courses.” The idea behind this was to select and feature courses that truly had a “world viewpoint,” so as to immerse students into viewpoints much deeper than the “only here and right now.” There was no specific subject matter for this program, only a requirement of a global viewpoint about the subject. At the time of our consideration, this University of Maryland “World Course” program had already attracted a lot of attention from administrators, students, and departments developing courses. A proposal was submitted to the “World Course” program to formally include our ESS course as one of the focused course recommendations. Not only was our proposal accepted, the campus leaders celebrated it, for it was the first hard science course to be included in the program.

Due to this acceptance, the University “World Course” program put forward special funds to encourage the faculty team members with salary bonuses for taking on the project, and also funded three graduate teaching assistants to expand the course activity and attendance. This provided the opportunity to enlarge the course enrollment, and establish formal discussion sections led by the graduate students. I might add that the establishment of these graduate student-led discussion groups also enhanced our graduate education programs, for each graduate student teaching assistant had to expand their own level of ESS interdisciplinary thinking in order to handle these educational assignments.

The creation and evolution of this ESSE stimulated course development caught the attention of other faculty here and there. Our first ESSE course stimulated interest in creating new, undergraduate interdisciplinary courses of an ESS flavor. The figure below summarizes the 10-year history of enrollment in the 123 course, from academic year 1994/5 to 2004/5, and identifies several other course developments following the theme of the ESSE Program. Some 2500 University of Maryland undergraduate students have received formal education in Earth system sciences during this ten-year period. Were we to offer sections of 123 both semesters, the outlook would be upwards of 500 students per year for a subject that has no college major of its own. A useful 21st Century university business strategy, I think.



## Earth System Science Education for the 21st Century



### EARTH SYSTEM SCIENCE UNDERGRADUATE COURSES

<b>AOSC*GEOG*GEOL 123 (3)</b> Causes and Implication of Global Change	<b>AOSC 200 (3)</b> Weather and Climate	<b>AOSC 201 (1)</b> Weather and Climate Laboratory
<b>AOSC*GEOL 234 (3)</b> Cycles in the Earth System	<b>AOSC*GEOL 375 (3)</b> Introduction to the Blue Ocean	<b>AOSC 400 (3)</b> The Atmosphere
<b>AOSC 401 (3)</b> Global Environment	<b>AOSC 431 (3)</b> Meteorology for Scientists & Engineers I	<b>AOSC 432 (3)</b> Meteorology for Scientists & Engineers II

### ADDITIONAL DISCIPLINARY COURSES ARE AVAILABLE FROM AOSC, GEOL, GEOG

#### ESSE Courses, Student Enrollment, Faculty and Assistants

COURSE	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	FAC	TAs	Depts
AOSC123	80	120	250	150	150	150	200	200	250	250	3-4	3	3
AOSC200						50	52	55	62	59	1	1	1
AOSC201						24	26	20	17	25	1	1	1
AOSC234										10	1	0	2
AOSC375										11	1	0	2
AOSC400	15	13	12	15	16	15	14	14	15	15	1	0	3
AOSC401	10	10	9	0	0	15	0	0	0	0	1	0	1
AOSC431				8	10	10	7	10	8	8	1	0	1
AOSC432				6	5	4	6	8	6	5	1	0	1
<b>TOTAL</b>	<b>105</b>	<b>143</b>	<b>271</b>	<b>179</b>	<b>181</b>	<b>268</b>	<b>305</b>	<b>307</b>	<b>358</b>	<b>383</b>	<b>3-4</b>	<b>3</b>	<b>3</b>

2500 students educated since ESSE-UMCP began in 1995