

Annual Report 2007-2008 Academic Year

**Center for Earth System Education
(CESE)**

Submitted to...

Chair of the Department of Geology & Meteorology

Dean of the College of Natural, Applied, & Health Sciences



Prepared and submitted by Paul J. Croft

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INTRODUCTION

The 2007-2008 academic year represented the first full year of leadership of the Center for Earth System Education (CESE) by Dr. Paul J. Croft since the first year of transition (2006-2007; see prior annual report). During this time CESE's programs and functions were reconsidered with regard to several Kean University initiatives (e.g., Institute for Urban Ecosystem Studies) and the New Jersey Center for Science, Technology, and Mathematics Education (NJCSMTE) within the Nathan Weiss Graduate College at Kean University. The CESE mission and program were revised, its website updated, and new activities initiated in order to acquire external support, community and professional partners, and base funding. These efforts were intended to build CESE capacity and capabilities to enable and foster new activities during the next academic year.

CESE MISSION & PURPOSE STATEMENTS

CESE Mission: The mission of the Center for Earth System Education at Kean University is to encourage, support, and promote earth system education at all levels. The earth system, comprised of both natural and human components, constitutes our world and determines the nature of our interactions and mutual impacts every day.

CESE Purpose: To earth scientists, learners, and teachers these components include the land (lithosphere), the water (hydrosphere), and the air (atmosphere). These are all interactive and dependent upon one another and with the biosphere. The biosphere includes plants, animals, and human populations worldwide. All are ultimately governed by the Earth's astronomical behaviors. These components must be understood in terms of their properties, behaviors, processes, and interactions; particularly with people in all settings (e.g., urban, rural, marine, and others). To accomplish this, scientists must observe, diagnose, and model each component of the system so that impacts may be avoided, mitigated or prevented. This suggests that everyone must know about the full geosphere, care about its impacts, and be prepared to act. The best manner to achieve this synthesis is through Earth System Education. Using relevant pedagogy and select teaching methods, as well as careful and targeted use of technology, teachers may help students truly understand the science that affects them everyday.

SUMMARY HIGHLIGHTS 2007-2008

During the 2007-2008 academic year the CESE program included various outreach, research, and developmental activities. Critical to these were funding provided by the Kean University Foundation (Faculty Research Award), cooperative and collaborative leveraging with both internal and external partners, and the strategic development and cooperative efforts of additional contacts and several new opportunities. These are summarized below with further elaboration in the text of this report.

- Outreach: Website/Products; Collaboratives – NJESTA, NJAS, NJCSMTE, KU
- Research: Grants/Projects – FFRA, NOAA ELG & MSI, IUES, McNair, QFI
- Development: Papers; Plans – CARPE DIEM, Students, Media, Leveraging

Outreach activities were supported by undergraduate students, mostly on an ad hoc basis with no stipend; and various faculty members. These were inclusive of a redesigned website with a variety of associated products, collaborative efforts with the NJESTA and NJAS annual conferences, initial coordination with the NJCSTME, and a variety of Kean University staff, programs, and centers. Additional outreach was accomplished collaterally through various courses (e.g., Observing the Earth [ES 1000] & Introduction to Meteorology [METR 1300]) which are taken by science and non-science majors. The use of Kean University media was similarly incorporated to make use of existing web, radio, and television resources on campus in order to reach a wider audience.

Research activities were focused on application to internal and external funding programs so as to develop support staff and products for use in both outreach activities as well as research experiences for Kean University students and regional K-12 audiences. The intent was to build capacity by acquiring resource support from federal programs. These were coordinated with regard to new or existing Kean University programs and centers and sought to take advantage of the leveraging that each offered. Two internal programs (QFI and McNair) have set the stage for summer and fall 2008 activities initiated by, or with participation by, CESE. These include a weather and environmental hazards symposium (November) and research for professional development of undergraduates.

As part of this year's efforts CESE development included generation of a white paper, a session summary, earth system science curricular materials, and a draft research outreach program for middle and high school students ("CARPE DIEM!"). In addition, students within the Department of Geology & Meteorology have assisted in outreach to K-12 groups and their teachers by providing tours, weather sessions, and visits to local schools. This has been enhanced by the production of Keancast products by students (through the Student Chapter of the AMS/NWA; a recognized student organization) that may be used online and/or accessed via Kean University radio and television.

These activities have provided CESE with an opportunity to compete as a key player in the region to solidify its leadership to the educational communities of New Jersey.

CESE 2007-2008 ACTIVITIES

Outreach activities first focused on a redesign and visioning of the website and brochure. The intent was to create a platform from which educational partners could share information and resources. The delivery of information on the website, although inclusive of links, focuses on providing lesson plans and related curricular materials that may be used and modified for explicit uses that the community member needs. In this manner, a growing resource base will reflect the needs of the full community and also provide a conduit for collaboration and development of new materials and new initiatives. These support frameworks help CESE in its mission to encourage, support, and promote earth system education at all levels and is part of its Round Table Earth program. This includes teacher workshops and educational sessions that allow stakeholders to establish partnerships that will bear useful products and pedagogical methods for the classroom.

Collaborative efforts of **CESE** have been developed to make effective use of resources available at Kean University and the larger community of educators. **CESE** worked directly with the New Jersey Earth Science Teachers Association, the New Jersey Academy of Sciences, the New Jersey Center for Science, Technology, and Mathematics Education to bring guest speakers to Kean University and to foster an environment for interaction among faculty, students, and the external communities. At the annual conference of NJESTA, **CESE** provided the keynote and breakout session speaker Michael Utley, a lightning survivor (with over 40 attending). For the keynote/luncheon speaker at the annual meeting of the NJAS **CESE** provided Jennifer Cox, a Senior Planner at the Regional Plan Association where she directs the Climate Change Program (with over 150 attending).

Work during the 2007-2008 academic year also included interactions with Kean University staff, programs, and centers such as NJCSTME, Epsilon Corps, and others. These included participation in research poster sessions, Science Celebration Day, Early College Awareness Day, and other activities sponsored by the College of Natural and Applied Health Sciences. While student majors were involved in these activities, additional outreach was accomplished through various courses taken by non-science majors (e.g., Observing the Earth [ES 1000] & Introduction to Meteorology [METR 1300]). In these instances majors worked directly with non-majors as consultants and tutors on projects. This included cooperative interactions with majors from the Computer Science Program. The **CESE** Director also participated in the Kean University FOCUS the Nation seminars in an effort to inform and engage a broader community of people.

Research activities focused on application to internal and external funding programs in order to develop support for outreach activities and research experiences for Kean University students and regional K-12 audiences. Applications were made internally to the FFRA and QFI programs at Kean University and externally to NOAA. Each was leveraged with Kean University's IUES and the new McNair award. The Foundation Faculty Research Award was received by the **CESE** Director and supported the establishment of the "WHERE – UR – in New Jersey!" program. This resulted in the delivery of a white paper on earth system education, the revised website, and the dissemination of a new brochure (with assistance from the Design Studio on campus). It also set the stage for development of research projects with undergraduate students on campus in an ongoing basis. The **CESE** Director also published a School Connections article "The Atmosphere: Science and Math System Integrator across the Curriculum" and a preprint "Kean University's Weather Hazard Education & Research for Ecosystems of Urban Relevance in NJ (Kean University's WHERE-UR-IN New Jersey!)" as part of the annual conference of the American Meteorological Society.

For the development of the center and its activities applications were made to two NOAA grant programs: Environmental Literacy & Minority Serving Institutions. These capacity building grants, although not funded, provided a basis for growth of **CESE** and will likely be resubmitted during the next funding cycles of the NOAA programs. The proposals, "Kean University's Weather & Environmental Hazards Assessment, Visualization, &

Education for New Jersey – Communities for Operational Responsiveness to their Environment (KU: WE HAVE NJ's CORE in mind!)” and “Kean University: Promoting Research for Operations & Verification while Integrating Diversity in Earth Science through Hazardous Events, Leveraging, & Partnerships (KU PROVIDES HELP!)” focused on the use of Earth System Science approaches in education, research, and awareness programs for improved environmental literacy of under-represented populations in urban zones prone to weather and environmental hazards, and climate variability impacts; and to promote and enhance sustainable diversity in atmospheric (and related) science, teacher education, and students through operational research on hazardous and other environmental systems for use in forecasting, applications, and verification in and near urban ecosystems.

Other research efforts leveraged support and interaction with Kean University's IUES and the newly initiated McNair program. On-going research focused on the occurrence of winter season fog and its detection and prediction through GIS applications; and the initiation and characteristics of summer season thunderstorm activity which both create additional hazards in an urban region. At the same time, evaluation of campus-based observations of environmental features continued through student independent studies and senior seminar classes; and in collaboration with Computer Science faculty (Dr. Pat Morreale). These have positioned the center to continue educationally relevant research projects that will be supportive of the McNair program. They also aided in acquiring funding through the Quality First Initiative for the planned symposium “Weather and Environmental Hazards – The Challenges of Awareness, Research, & Education in New Jersey (KU: WE CARE about NJ!)” to be held in November 2008.

Development activities have included the generation of a white paper, a sample concept map, and a draft research outreach program for middle and high school students (CARPE DIEM!). The white paper “Earth System Education – Moving from Susceptibility to Awareness and Action” was prepared to encourage awareness and education with regard to the earth sciences which are critical to our livelihoods. These include economic, social, political, and cultural manifestations that must be bridged together to provide effective responses to the natural environment and its associated hazards, particularly in urban regions. A session summary was prepared from the NJESTA conference keynote and breakout session on lightning to consider the issues and challenges facing educators and other stakeholders when making use of scientific information, data, and resources in a curricular framework. This has been leveraged with the development of a weather and climate data portal as supported by the CESE Director's UFRI project. The web portal is designed to support education as well as research and includes media related information and connections to the student chapter of the AMS/NWA.

Each of these is supportive of the on-going effort to engage middle and high school students in research activities with Kean University faculty and undergraduate students. Currently this involves the Chatham High School as a prototype and has led to the creation of a program “Collaborative Atmosphere for Research Practicum in the Environment: Direct Interactions, Education, and Modalities! (CARPE DIEM!)” in collaboration with a local science teacher. The intent of the program is to build capacity

by providing opportunities for collaboration between middle and high school students and their peers at Kean University in the Department of Geology & Meteorology. Collaborations include research, outreach, and service activities that broaden student perspectives as they explore their interests in science and plan a college career. In the process, middle and high school students make use of their content and analytic skills according to their achievement of the science standards – at both the state and national level. In both the middle and high school level projects students are stakeholders within their peer community and help demonstrate the utility of science.

The use of Kean University media has also been incorporated with [CESE](#) activities through existing web, radio, and television resources on campus. Students involved in this activity worked with Kean University staff, and occasionally students from the Department of Media & Film; to create forecast information and products, sample public service announcements, and live interview. A blog has been created and will be expanded in the next year of activities. The intent of these efforts has been to inform the Kean University community on campus directly with regard to current and predicted environmental conditions and will ultimately lead to consideration of a hazardous impact advisory program. This is being aided by work in progress through the Institute for Urban Ecosystem Studies and leveraged with continuing efforts through the UFRI Program grant “Kean University: Weather and Ecosystem Monitoring, Assessment, and Prediction for Integration and Training” (KU: WE MAP IT).

FACILITIES & RESOURCES

There continues to be no dedicated office space for [CESE](#), and limited resource materials as housed in the Department of Geology & Meteorology. There is also no direct secretarial, graduate student, or administrative support provided to [CESE](#). A request has been made for graduate student support during the upcoming year. Opportunities to share resources through the NJCSTME and other Kean University programs will be explored.

STRATEGIC INITIATIVES, ACTIVITIES, & PLANS FOR 2008-2009

During the 2008-2009 academic year, [CESE](#) will emphasize the online integration of resources, teacher workshops and educational training sessions (as part of the Round Table Earth program) towards the development of an urban ecosystem curricular guide in order to generate a stakeholder white paper for the community. As part of this process a virtual linkage will be established to encourage cooperative & collaborative research workshops and to support a website hub with pedagogy constructs.

The initiation of research outreach projects will allow the formation of a Working CORE (Working in a Community of Outreach Research Experiences) among educators and students that facilitate interactions and supports efforts to become self-sustaining with time. The focus will be on hazardous weather and the impacts of various atmospheric conditions with regard to urban locations through the use of observational data, conceptual and analytic diagnoses, modeling, and prediction. The center will continue to seek external support for its mission and programs.

DOCUMENTATION

The following documentation is provided in support of this report. Additional information may be available through the program website and/or by request.

- ❖ Website Development & Brochure
- ❖ NJESTA and FOCUS the Nation Presentations
- ❖ Guest Speakers (Utley, Cox)
- ❖ Curricular Materials Development (in progress)

- ❖ FFRA & QFI Proposals (project summaries)
- ❖ School Connections article
- ❖ AMS Preprint article
- ❖ NOAA Proposals (ELG, MSI)

- ❖ White paper
- ❖ Concept Mapping (sample)
- ❖ CARPE DIEM!
- ❖ Media (continuing)