Broader Impacts at the Kimballton DUSEL: Education and Outreach (E&O)
Preliminary Plan

Rationale
“If America is to sustain its international competitiveness, its national security, and the quality of life for its citizens, then it must move quickly to achieve significant improvements in the participation of all students in mathematics and science,” begins a report issued on February 16, 2005 by the Business-Higher Education Forum titled *A Commitment to America’s Future: Responding to the Crisis in Mathematics and Science Education*. The report calls for business, higher education, and policy leaders to organize and implement a nationwide plan that addresses the quality of the mathematics and science education provided to all students, “in collaboration with classroom teachers and school administrators and taking advantage of the promising work they have already initiated.” From <<http://science.nsta.org/nstaexpress/nstaexpress_2005_02_22_bhef.htm>

NSF and other national science organizations concur, identifying Science, Technology, Engineering, and Math (STEM) education as a critical need in our nation (NSB 2004). Programs at local, state, national and international levels seek to develop skills in these [STEM] areas. Our target audiences include students, teachers, scientists, practicing professionals, officials, legislators and the public. To meet the science and engineering workforce needs and future regional economic development, Appalachia must become a source of future scientists and technical personnel. Inclusion of this diversity would be a deliberate focus of E&O from this project.

Several reports have presented detailed plans for E&O that could be applied to an underground laboratory (EarthScope 2002, EarthLab 2003, NeSS 2002, NUSL 2001). These highlight opportunities to appreciate basic science alongside practical applications of multidisciplinary learning and technology. The Kimballton DUSEL will leverage and build collaborative projects with established local networks from VT-STEM (a university-wide outreach initiative) and with E&O programs such as NASA Astrobiology Institutes, EarthScope, GLOBE, and others. Partnerships targeting E&O activities will be developed with informal education venues, schools, community, and professional organizations.

An advantage of the Kimballton location is that it is within a day’s drive for 50% of the U.S. population (New River Valley Planning District Commission Regional Data Book, 2004) making site visitation a possibility for many and offering the potential for distance education combined with onsite learning. Unique to this location is the potential for partnership with USFS Jefferson National Forest Blacksburg Ranger District in building a joint visitor center on Butt Mountain, availability of VT’s Mobile Lab enhanced for off-site visits exploring DUSEL science questions, and eager participants who have not had access to this kind of “big science” before.

A major, but not inherently obvious, opportunity for E&O lies with the international
nature of the lab. In addition to STEM literacy, much concern also goes into preparing our society to better participate in a global economy. We can anticipate far more opportunities for interaction between people from different cultures as a result of this project. This will cut both ways: we need to be prepared to do E&O for international visitors and researchers, as well as providing E&O for local and national groups. These efforts will be both formal and informal. Locally, the Southern Appalachians have limited opportunities for these kinds of rich international interactions. This project will definitely increase global awareness in this location, as well as increasing STEM literacy.

Virginia Tech is the senior Virginia land-grant institution, and has a long history of community education and outreach to improve economic and social well-being. The University has recently renewed its commitment to outreach and extension: the Division of Outreach and International Affairs has programs across Virginia, the United States, and in countries around the world, as well as here in Appalachia. <http://www.outreach.vt.edu/about.html/>. The Cooperative Extension Division alone engaged over 40,000 volunteers in support of its programs throughout the Commonwealth <http://www.ext.vt.edu>.

One group that will certainly be active with the Kimballton DUSEL E&O programs is VT-STEM, the Virginia Tech Science Technology Engineering and Mathematics K-12 Outreach Initiative <http://www.stem.vt.edu>. This is an interdisciplinary group of people and programs that share research and resources among the university community, K-12 education, and other partners to contribute to Virginia's leadership in K-12 science, technology, engineering, and mathematics education.

VT Geosciences is a founding member of VT-STEM. Geosciences direct service outreach programs reached over 6800 people in Fall 2004, including teacher workshops, public programs, visitors and school visits to the Museum of Geosciences, and materials loaned through the Education Resource Center. Many more people were served through the Geosciences websites developed by departmental research groups and projects, and by faculty responses to public inquiries.

Beyond science and engineering, a variety of research projects in STEM educational theories and methods will be possible through evaluation of informal and formal programs and products emanating from the Kimballton DUSEL. Assessment and evaluation will be part of the instructional design for all our E&O projects. Wide sharing of results is an important role for the project as a model of integrated research and education.

**Goals**

E&O goals for the Kimballton DUSEL will be developed in consultation with scientists, formal and informal educators, regional partners, and other collaborators and colleagues from large-scale education and outreach projects. A major intent is the enhancement of science, technology, engineering, and math (STEM) education achievements and literacy on the ground, as well as exploring innovative STEM education methods and research.
Increase the broad recognition of Southern Appalachia as a place engaged in Big Science, building on NASA’s Marshall Space Flight Center, Huntsville, AL, DOE’s Oak Ridge National Labs, Oak Ridge, TN, the University of Tennessee-Knoxville, Virginia Tech, NSF’s National Radio Astronomy Observatory at Green Bank, WV, etc. This is a sea change from the now waning extractive industries historically associated with the region, and offers a new global economic base for the region.

Share the questions, methods, and results emanating from Kimballton DUSEL projects to encourage the broader community to embrace and support research as well as to attract additional projects and funding.

Inspire male and female students and citizens in the Southern Appalachians to pursue the learning needed in science and technology careers. Increase opportunities for students and citizens from all economic backgrounds to become thus engaged.

Energize K-12 and college faculty through access to state-of-the-art research, teaching, and learning facilities in a real-world, international, multidisciplinary lab setting.

Evaluate and disseminate E&O efforts to continue improvements in effectiveness. E&O of the Kimballton DUSEL will help create a national model for increasing the participation of male and female students and citizens of rural America in science and technology. This diversity will strengthen future economies based on science and technology for those rural areas.

**Partners**

There are many large collaborative projects that are underway in the sciences that will be at the Kimballton DUSEL. They will be powerful partners. We will research these and access them as appropriate to inform our work and to re-use wheels that are already invented and rolling out there. They can also quickly lend national and international scope to our E&O. Ones we are already working with include EarthScope, GLOBE, NASA Astrobiology, East Tennessee Science Partnership (ETnSP), and Appalachian Mathematics and Science Partnership (AMSP).

Local school systems in both Virginia and West Virginia and regional undergraduate and community colleges will be important partners.

Informal educational venues not only will be educational partners, but will also be part of regional tourism marketing. Collaboration for tourism marketing has just begun in the region. This project could be a keystone to help smaller venues, and highlight education as a value-added for tourism. The Visitor and Education Center would become a tourism “destination” drawing visitors deeper into this area of Appalachia.

We will be working with the Community Engagement-Public Relations group to coordinate community input meetings and workshops. In garnering initial input, Education and Outreach and Community Engagement will likely use similar strategies.
Features, Facilities Planning: Kimballton DUSEL E&O Infrastructure
Modularity and flexibility, as stated in S-1, is key. (S-1 supplemental materials, p. 24)

E&O will encourage the use of Universal Design Principles (UDP) throughout to provide accessibility for the maximum number of people, keeping in mind international audiences.

Dedicated E&O staff is essential in a facility with this mission.

Some separate, safe, noise-limited spaces (outdoor, indoor, and possibly underground) will need to be committed to E&O needs. Lab and classroom spaces intended only for E&O will deepen the educational experiences possible for K-12, college, professional, and public visitors. In research labs, providing additional space beyond the research need and enhancing the visibility of operations will increase E&O possibilities.

As stated in S-1 this facility presents many educational opportunities in STEM (Science, Technology, Engineering, and Math) as well as other disciplines, and will provide outreach and interpretation for diverse audiences. Valuing the ideal of education and outreach happening side-by-side with international research leads to additional resources and infrastructure, and incorporation of universal design principles. These will enhance the facility for researchers also.

Interpreted design and construction makes lab elements and facilities into educational platforms. The facilities could also be demonstration grounds for the remarkable challenge of Leadership in Energy and Environmental Design (LEED) construction at a major research laboratory. This consideration will be even more appropriate by the time construction is completed. There will be many opportunities for E&O around the facility and its construction and operation.

Our E&O should encourage the use of Universal Design Principles to provide accessibility to the maximum number of people, keeping in mind international audiences.

Above-ground site interpretation and E&O design elements should also be incorporated as design proceeds. Locations for outdoor interpretive signage can be planned to work with overall site design.

Time Lines:
*Short term: (year 1)*
Web page
Community forum and education for local citizens and decision-makers
Posters/flyers, bookmarks
Investigate VT Mobile lab expanding to DUSEL science
Leveraging with other programs for K-12 activities, i.e. K-12 in-services, scientists visiting schools, SHADES, GLOBE, tours
Build partnerships
Facility design involvement
Evaluation and assessment
**Mid term: (year 2-4)**

- On-site and satellite exhibits
- REU teacher workshops
- Coordinating DUSEL research with education and outreach
- Developing K-12 curricular products, outreach products
- Foster partnerships and expand networks
- Facility design
- Evaluation and assessment

**Long term: (year 4+)**

- K-12 curricula product dissemination
- Product dev./dissemination: video, remote access/experimentation, interactive exhibits
- Expanding DUSEL research with education and outreach activities
- Building partnerships
- Facility design
- Evaluation and assessment

**References**


