1995-96

DE-FC04-90AL66158

Preface

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The Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) Environmental Technology Consortium was established in 1990 with the financial assistance of the Department of Energy (DOE). By supporting this unique Consortium, DOE reached out to historically underutilized and underrepresented groups to provide access to environmental education and environmental careers. Under a cooperative agreement with the DOE, environmental restoration and management issues have been infused into traditional courses, and new courses, curricula and degree programs have been developed. Additionally, new technologies for environmental remediation and restoration are being developed and deployed. These curricula and technology development activities of the Consortium provide a major resource of environmental education and training programs for DOE employees and contractors and for personnel from environmental companies.

The new challenge for the DOE Office of Environmental Management (EM) and its Office of Training and Education (EM-13) is in curriculum design for the Technical Qualifications Program (TQP) mandated by the DOE Defense Nuclear Facilities Safety Board (DNFSB). Under this program, Learning Activity Design Specifications (LADSs) guide the development and delivery of an EM Education program to DOE employees who need to meet the mandates of the DNFSB. The academic partners of EM are building upon prior curriculum development activities to develop and deliver traditional courses, Computer-Based Training (CBT), and distance learning courses. Additionally, short-term specialized courses for career development will be available.

The Consortium institutions recognize that long-term sustainability of the global environment requires participation of all sectors of our society. Consequently, in 1996, the Consortium institutions engaged in various activities to develop the knowledge, skills, and strategies that promote environmentally sustainable living for this and future generations.

The Council of Presidents and the Steering Committee of the Consortium acknowledge with thanks the Department of Energy's support and commitment, especially, the Office of the Assistant Secretary for Environmental Management (EM-1); the Office of the Deputy Assistant Secretary for Management and Evaluation (EM-10); the Office of Training and Education (EM-13); and the DOE Albuquerque Operations Office.

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Chair
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Kofi B. Bota
Director

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MASTER

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EXECUTIVE SUMMARY

The HBCU/MI ET Consortium was established in January 1990, through a Memorandum of Understanding (MOU) among its member institutions. This group of research-oriented Historically Black Colleges and Universities and Minority Institutions (HBCUs/MIs) agreed to work together to initiate or revise educational programs, develop research partnerships with public and private sector organizations, and promote technology development and transfer to address the nation's critical environmental problems.

While the Consortium's Research, Education and Technology Transfer (RETT) Plan is the cornerstone of its overall program efforts, the initial programmatic activities of the Consortium focused on environmental education at all levels with the objective of addressing the underrepresentation of minorities in the environmental professions.

In 1996, the environmental education program focus was expanded and the Technical Qualifications Program of the Department of Energy's Office of Environmental Management became the working agenda. This initiative was mandated by the Defense Nuclear Facilities Safety Board's (DNFSB) report to Congress that courses be developed to satisfy technical competency levels at federal nuclear facilities in the Department of Energy work force. A second major program focus for the member institutions was research and development in environmental restoration and remediation technologies/.

In 1996, the Consortium also conducted workshops, and developed and implemented education for sustainability projects through a partnership with Second Nature, Inc. The objective of these education for sustainability projects was to develop the knowledge, skills, and strategies that could effectively make environmentally just and sustainable living "second nature" to this and future generations.

The Consortium is a resource for collaboration among its member institutions, federal and state agencies, national and federal laboratories, industries (including small and historically underutilized businesses), other universities, and two and four-year colleges. As a group of seventeen institutions geographically located across the southern United States, the Consortium is well positioned to reach a diverse group of women and minority populations of African Americans, Hispanics and American Indians.

This 1996 Annual Report provides an update on the activities of the Consortium with a focus on environmental curriculum development for the Technical Qualifications Program (TQP) and Education for Sustainability.

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INTRODUCTION

Increasing worldwide concern about the quality of the environment has forced federal, state and local governments, industry, academia, foundations and non-profit organizations to examine environmental policy alternatives. There is considerable interest in finding safer, cheaper and more efficient methods for waste elimination and reduction, treatment, storage and disposal and clean-up of contaminated sites. Such contamination, involving radioactive, hazardous and solid wastes has affected not only air, soil and surface water, but also the subsurface vadose zone and groundwater in wells and aquifers.

Several environmental laws and regulations have been enacted by the federal government to identify, reduce, treat, control and properly dispose hazardous and solid wastes and materials. Additionally, enforcement of these federal regulations by federal departments, including the Environmental Protection Agency (EPA), the Departments of Energy (DOE), Defense (DOD), Transportation (DOT) and Health and Human Services (HHS) have implemented agency-specific environmental restoration and waste management programs.

In response to federal agency initiatives and public concern, a group of leading research-oriented Historically Black Colleges and Universities (HBCUs) and Minority Institutions (MIs) formed a consortium in January 1990 to conduct research, education, technology transfer and exchange programs in environmental technology and waste management. The institutions have agreed through a formal Memorandum of Understanding to work together to make significant contributions to the nation's efforts to solve environmental problems. The member institutions have substantial enrollments of minority students and offer at least two graduate degree programs in the natural sciences or engineering. They also have a substantial track record for research in these disciplines. Furthermore, they have produced a large number of minorities with bachelor's and advanced degrees in the natural sciences and engineering who are pursuing successful careers in industry, government and academia.

The objective of the HBCU/MI Consortium is to

combine the efforts of its member institutions to expand the nation's research, education and technology transfer and exchange capabilities in both the public and private sectors in the management of radioactive, hazardous and solid wastes, including related energy, health, space and defense technologies. The Consortium is a national model of collaboration among the participating academic institutions, federal and state agencies, national federal facilities and laboratories, industry (including small and historically underutilized businesses), majority universities and two and four-year colleges. As well, the Consortium is a resource for education and research programs to develop, transfer, and use new environmental technologies; also to increase the expertise and sensitivity to critical national issues.

The Department of Energy ran a Notice of Program Interest in the Federal Register in April 1990 requesting proposals from academic organizations which wanted leadership roles in academic partnerships for environmental education and technology development. The program's focus was environmental technology development with the concomitant goal of increasing the number of scientists, engineers and other professionals in environmental careers. In September 1990, the Secretary of Energy announced that the HBCU/MI Environmental Technology Consortium had won the competition. A cooperative agreement between DOE and the Consortium was signed in October 1990.

In 1995, the Department of Energy (DOE) made a major program expansion in its environmental education programs after an assessment concerning safety at defense nuclear facilities by the Defense Nuclear Facilities Safety Board (DNFSB). The Board reported to Congress as follows: "In each of its first four annual reports, the Board recognized the most important and far-reaching problem affecting the safety of DOE defense nuclear facilities is the difficulty in attracting and retaining personnel who are technically qualified to provide the management, direction and guidance essential for safe operation of DOE defense nuclear facilities. It remains the most critical problem today." In establishing the Board in 1988, Congress was well aware of this problem. Hence, the Senate

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Conference Report that accompanied the Board's enabling legislation stated: "The Board is expected to raise the level of technical expertise in the Department substantially . . . "; hence, the Department's expansion of its programmatic effort to improve the technical competence of its work force through the development and delivery of educational and training programs.

The Department of Energy instituted the Technical Qualifications Program (TQP) as a means for evaluating the technical competence of its employees. Since DOE employees monitor high hazard activities at defense nuclear facilities; this critical task involved protection of public health and the environment. The learning objectives needed to provide technical competencies for these employees could be met from a variety of sources. However, DOE accepted the offer of the Academic Partners of the Office of Environmental Management to provide assistance in this regard. The Office of Environmental Management (EM) decided to design and sponsor a standardized series of "Learning Activities" in the environmental restoration and waste management subject areas of the Technical Qualifications Program. These Learning Activity Design Specifications (LADSs) contain the requirements to support the TQP by keying learning objectives to technical competencies that will meet certain job performance requirements. Through the use of this standardized approach, DOE managers and decision makers can be reasonably assured that their work force will have the opportunity to complete and master the competencies covered by the learning activities.

The HBCU/MI Environmental Technology Consortium

The HBCU/MI Consortium was formed to respond to national R&D, policy formulation and minority manpower needs in environmental technology, hazardous, solid and mixed waste management, environmental restoration and environmental health; and to address limited minority

participation in the public, private and non-profit environmental industries; limited environmental awareness among minorities; minimal interaction between HBCUs/MIs and other universities, industry and interest groups; limited institutional development in environmental education and research; and lack of minority technology-based businesses in the environmental technology development and deployment field.

The Consortium institutions, locations, and minority populations served are shown in Figure 1.

*Geographic Location of Member Institutions
Figure 1*

<i>Location</i>	<i>University</i>	<i>Minority Population Served</i>
1	Alabama A&M University	African American
2	Clark Atlanta University	African American
3	Florida A&M University	African American
4	Florida International University	Hispanic, African American
5	Hampton University	African American
6	Howard University	African American
7	Jackson State University	African American
8	New Mexico Highlands University	Hispanic, American Indian
9	North Carolina A&T State University	African American
10	Northern Arizona University	Hispanic, American Indian
11	Prairie View A&M University	African American
12	Southern University at Baton Rouge	African American
13	Texas A&M University – Kingsville	Hispanic
14	Texas Southern University	African American, Hispanic
15	Tuskegee University	African American
16	University of Texas at El Paso	Hispanic
17	Xavier University	African American

GOALS AND STRATEGIES

The HBCU/MI Environmental Technology Consortium's response to the national environmental crisis is to increase minority participation in the environmental professions by improving outreach and pre-college education; undergraduate education and post-secondary training; graduate and post-graduate education and research; and technology development and transfer. A description of the Consortium's Research, Education and Technology Transfer (RETT) Plan follows.

Minority Outreach and Pre-College Education

Goal: To increase the amount, access and quality of mathematics and science education and information dissemination in minority communities.

Develop and Implement Mathematics and Science Programs for Minority Parents and Children (Pre-K-12) and Pre-college Teachers

Actions

- Literacy Programs
- Formal/Informal; School-Based/Home-Based Activities
- Student Recognition Programs
- Work/Study Programs
- Mathematics & Science Enrichment Programs (Saturday, Summer, and After-School)
- Career Awareness and Orientation Activities
- Parenting Skills

Promote Public and Private Industry Linkages with Minority Elementary and Secondary Schools

Actions

- Adult and Youth Awareness Programs
- School-Based Interventions and Awards/Recognition Programs
- Industry/Education Developed Learning Materials
- Industry Speakers, Precepts, Laboratory Experiences
- Student Interactions such as Science and Mathematics Fairs

Develop Core Elements of Pre-college Programs in the Energy and Environmental Sciences

Actions

- State/Local Education Department Joint Curriculum Planning and Design with Energy and Environmental Industry and National Laboratories
- Instructional Materials Development
- Video Development and Presentation on science-based activities and applications within the energy industry; simple "How to" experiments conducted by industry, university, and national laboratory scientists that can be relocated within local school districts

Accelerate Certification and Professional Training of Science and Mathematics Teachers

Actions

- Scholarships
- Specialized Institutes and Workshops
- Participation in Federal, State and Private Industry Research and Development Projects
- Teacher Retraining and Continuing Education in the Energy and Environmental Sciences

Undergraduate Education and Post-Secondary Training

Goal: To increase the number of qualified minority professionals available to teach and work in the sciences and engineering, especially the energy, materials and environmental sciences.

Develop and Implement Activities at the Undergraduate Level that will Increase the Number of Minorities Retained in the Pipeline for Graduate Training in the Sciences and Engineering

Actions

- Scholarships
- Career Counseling Resource Materials
- Undergraduate Research Participation
- Summer Internships and Co-ops
- Role Model Training Programs for Minority Science Student Mentors

Develop Programs to Retain Minority Faculty and Trainers as Mentors and Role Models

Actions

- Undergraduate Research Programs
- Faculty Exchanges
- Institutional Rewards for Faculty
- Faculty Retention Incentive Programs
- Summer Industry Enrichment Programs

Identify Elements and Recommend Implementation of Strong Undergraduate Programs in the Sciences, Mathematics and Engineering Disciplines with Minor Programs in the Energy, Materials and Environmental Sciences

Actions

- Special Emphasis Courses — Hazardous Materials, Radioactive and Hazardous Waste Management, Survey Techniques, etc.
- Teaching Materials — Textbooks with Industry-defined Programs and Exercises; Computer Software Development; Hands-on Training
- State-of-the-art Environmental Process and Product Information Conversion to Teaching and Training Materials

Graduate and Postgraduate Education and Research

Goal: To develop nationally recognized capabilities within the Consortium to provide graduate research, education and support to minority students at the master's and PhD levels in those sciences and engineering areas that support the energy, environment, and solid, hazardous and radioactive waste handling industries.

Develop a Clear Statement of the HBCU/MI Consortium's Capabilities Consistent with Federal, State and Industry Priorities and Needs

Actions

- The HBCU/MI Consortium Capability Statement

Plan and Coordinate the Development and Support of the Consortium's Interdisciplinary Academic and Research Programs that Build Upon Institutional Strengths and Track Records in the Sciences and Engineering

Actions

- The HBCU/MI Consortium Interdisciplinary Program Description

- RETT Plan Update Consistent with DOE's Annual RDDTE Plan
- RETT Plan Update Consistent with other Federal, State and Private Industry Programs in Environmental Policy, Hazardous Materials and Waste Management

Provide Competitive Fellowship Support and Industry Access to Minority Graduate Students Pursuing Master's and PhD Studies at the Consortium Institutions in Energy and Environmental Sciences and Engineering

Actions

- The HBCU/MI Consortium Fellowship Program
- Summer and Co-op Placement in the Public and Private Sectors

Technology Transfer

Goal: To effect technology transfer among HBCUs/MIs, the environmental industry, and Federal and state governments.

Create Consortium Technology Development Centers that Establish Linkages with the Environmental Industry and National and Federal Laboratories and Technology Centers for the Development and Application of Priority Technologies

Actions

- Student/Faculty Placement with Industry as Research and Development staff
- HBCU/MI and Industry Joint Technology Development
- Contract and Subcontract Opportunities
- Information Clearing House
- Faculty Exchange with Industry and Government Personnel

Promote the Development of Competitive Minority Technical Entrepreneurial Talent and Businesses in the Environmental Technology Areas

Action

- Resource Exchanges—personnel, specialized equipment, facilities

Joint Technology Development

Minority Technical Businesses (MTB) Resource and Incubator Centers — support services in contract management, business plan development, accounting, patent and non-disclosure policies, marketing, research, prototype development, etc.

Establish Environmental Technology Minority Manpower Training Centers and Programs

Actions

- Credit and Non-Credit Short Courses
- Environmental Technology Management Training Institutes
- Joint Development and Sponsorship of Certified Training Programs for Industry and Government Personnel

The Consortium's program has six prongs: program development; faculty development; curriculum development; recruitment and retention; outreach (pre-college education, community, business); and technology transfer.

The Consortium member institutions have continued to strengthen their individual infrastructures in order to

implement the Consortium objectives. Some institutions have created centers that serve as the focal point for environmental activities. These centers have spearheaded efforts to expand environmental curricula by modifying courses to add or upgrade environmental science content. In addition, these centers have reexamined degree programs and course offerings, sponsored pre-college student and teacher training programs, and have fostered research and technology development and transfer programs.

Consortium Institutional Demographics

Table 1 gives the demographic data on students at the 17 HBCU/MI Universities. Twelve have between 75% and 99% African American students (Alabama A&M, Clark Atlanta, Florida A&M, Hampton, Howard, Jackson State, North Carolina A&T, Prairie View A&M, Southern, Texas Southern, Tuskegee and Xavier). Four institutions have over 50% representation of Hispanic students (Florida International, New Mexico Highlands, Texas A&M University-Kingsville, and the University of Texas at El Paso). A third minority group, American Indians, have a 4% representation at New Mexico Highlands and a 6% representation at Northern Arizona.

Table 1. The 1996 Demographics of Member Institutions

Type	AAMU public	CAU private	FAMU public	FIU public	HaU private	HoU private	JSU public	NMHU public	NCAT public
Faculty	5206	5230	10,395	28,171	6035	10,652	6313	2839	7846
Students	54	68	58	58	59	59	58	58	50
% Male	<1	<1	1	52	<1	<1	<1	65	<1
% Female	<1	<1	<1	3	<1	1	<1	<1	1
% African Amer.	8	27	1	5	2	1	0	1	1
% Hispanic									
% Native Amer. Indian									
% Asian									
% Anglo									
% International									
Type	NAU public	PVAM public	SU public	TAMU-K public	TSU public	TU public	UTEP public	XU public	
Faculty	20,131	5999	9500	6048	9377	3229	16,275	3467	
Students	59	48	57	49	60	50	54	69	
% Male	9	1	<1	64	3	<1	64	<5	
% Female	<1	1	<1	<1	2	1	1	2	
% African Amer.	2	<1	2	5	8	1	9	<2	
% Hispanic									
% Native Amer. Indian									
% Asian									
% Anglo									
% International									

CONSORTIUM

The policy making body of the Consortium is the Council of Presidents. The Consortium Director reports directly to the Council and serves as its secretary. A Steering Committee, under the leadership of a chair, implements the Council's general policies. The chair of the Steering Committee also serves as a non-voting member of the Council.

The Consortium Organizational/Management Flowchart

The Council of Presidents

The Council of Presidents is the policy making body of the Consortium. The President of each institution serves as a member. The Council meets once a year to review and discuss the Consortium's policies; to make recommendations concerning new and improved ways for continued implementation of the Consortium activities; and to discuss means for self-sufficiency.

Overall policy direction for the Consortium is provided by the Chair of the Council of Presidents. The current Chair is Dr. Frederick Humphries, President of Florida A&M University.

The Consortium operates under the auspices of Clark Atlanta University in Atlanta, Georgia. The Consortium headquarters provides day-to-day management. It is managed by the Consortium Director, Dr. Kofi B. Bota, and staff. The director is assisted by the associate director and program manager, August O. Curley, and other support personnel.

Steering Committee

The responsibilities of the Steering Committee are to implement the general policies of the Council of

Membership of the Council of Presidents is as follows:

Dr. John T. Gibson
President
Alabama A&M University
Normal, Alabama 35762

Dr. Thomas W. Cole, Jr.
President
Clark Atlanta University
Atlanta, Georgia 30314

Dr. Frederick S. Humphries
President
Florida A&M University
Tallahassee, Florida 32307

Dr. Modesto A. Maidique
President
Florida International University
Miami, Florida 33199

Dr. William R. Harvey
President
Hampton University
Hampton, Virginia 23668

Dr. H. Patrick Swygert
President
Howard University
Washington, DC 20059

Dr. James Lyons, Sr.
President
Jackson State University
Jackson, Mississippi 39217

Dr. Selimo Rael
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New Mexico Highlands University
Las Vegas, New Mexico 87701

Dr. Edward B. Fort
Chancellor
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Dr. Charles Hines
President
Prairie View A&M University
Prairie View, Texas 77446

Dr. Marvin Yates
Chancellor
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College
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Presidents, recommend new directions for Council consideration and action, plan and evaluate the long- and short-term goals and programs of the Consortium, and carry out assignments or functions under the leadership of its chair. Committee members also act as the Consortium point of contact for the member institutions and provide general coordination for Consortium activities at their respective institutions. They assume local program management responsibility for institutional projects and the fiscal implementation of subcontracts issued by the Consortium to their institutions, subject to federal or other procurement and management regulations.

Steering Committee Chairperson

The chair of the Steering Committee is responsible for general oversight of the affairs of the Consortium and the implementation of Council policy. In addition, the chair is responsible for the formulation, program direction, and operation of the Consortium's Standing and Ad-Hoc Committees.

Standing and Ad-Hoc Committees

These committees guide the Consortium's business in research, development, education, technology transfer, and training. There are four Standing Committees and two Ad-Hoc Committees:

Dr. Manuel L. Ibanez
President
Texas A&M University-Kingsville
Kingsville, Texas 78363

Dr. James Douglas
President
Texas Southern University
Houston, Texas 77004

Dr. Benjamin F. Payton
President
Tuskegee University
Tuskegee, Alabama 36088

Dr. Diana Natalicio
President
University of Texas, El Paso
El Paso, Texas 79968

Dr. Norman C. Francis
President
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Standing Committees

Committee on Outreach and Pre-college Programs
Committee on Undergraduate Education
and Post-secondary Training
Committee on Graduate and Post-Graduate
Education and Research
Committee on Technology Transfer

Membership of the Steering Committee is as follows:

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The Department of Energy Technical Qualifications Program (TQP)

The Consortium institutions focused on the development and delivery of courses to meet the requirements of the Department of Energy Office of Environmental Management (EM) Technical Qualifications Program (TQP) as specified by the Learning Activity Design Specifications (LADSs). The instructional design (selection of learning settings, strategies and methods; instructional techniques, modes and materials; and student evaluation methods) of these courses is set up in accordance with the LADSs. The courses will be developed at various levels (undergraduate junior and senior levels, and first year graduate level) in the following nine topical areas:

1. Orientation to the Office of Environmental Management (EM)
2. Environmental Sciences
 - a. Geology/Seismology
 - b. Soil Science
 - c. Hydrology/Geochemistry
 - d. Meteorology
 - e. Biology/Ecology
 - f. Toxicology
3. Fundamentals of Environmental Laws, Regulations & Orders
 - a. Basics: Enforcement, Liability, Difference Between Regulations/Orders/Standards
 - b. Resource Conservation and Recovery Act (RCRA)
 - c. Federal Facilities Compliance Act (FFCA)
 - d. Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA)
 - e. National Environmental Policy Act (NEPA)
 - f. Hazardous Materials Transportation Act (HMTA)
 - g. Clean Air Act (CAA)
 - h. Clean Water Act (CWA)
 - i. Pollution Prevention Act (PPA)
 - j. Safe Drinking Water Act (SDWA)
 - k. Endangered Species Act (ES)
 - l. Natural Resource Damage Assessment (NRDA)
 - m. Native American Graves Restoration Act
 - n. American Indian Religious Freedom Act (AIRFA)
 - o. Toxic Substance Control Act (TSCA)
 - p. Atomic Energy Act (AEA)
 - q. DOE Natural Resource Trustee Regulation
 - r. American Indian Treaties
 - s. Floodplains and Wetlands
 - t. Noise
 - u. Executive Order 12856, Environmental
4. Fundamentals of Waste Management
5. Waste Management Science
6. Monitoring and Sampling
7. Site Remediation and Clean-Up & Monitoring and Sampling
8. Advanced Waste Management & Advanced Laws and Regulations
9. Environmental Management and Sampling

Improving the technical performance of the DOE work force is the ultimate goal of the TQP program. The program objectives are designed to:

- Reduce environmental health and safety risks by reating a technically knowledgeable workforce;
- Reduce mortgage and overhead costs through improved technical oversight and insight;
- Increase the knowledge base and keep up-to-date in the areas of environmental science, environmental health science and toxicology, and environmental engineering and technology; and
- Improve cooperation and understanding between DOE and its regulators and stakeholders.

The program will make available courses for the continuing professional development of the DOE work force. It will meet the programmatic and fiscal needs of the DOE 93-3 Implementation plan; evaluate DOE's training efforts as mandated by the DNFSB; and meet the DOE work force transition needs. The approach will be to develop, implement and coordinate an environmental education and training program that: 1) integrates all required DOE-wide environmental competencies; 2) utilizes the best practices in education and training; and 3) incorporates the latest "lessons learned."

The TQP courses will feature extensive utilization of:

- site-specific case studies and DOE site-specific lesson ,
- instruction by recognized technical and educational experts;
- college credits for courses completed;
- high quality lectures and supplemental materials;
- on-site delivery of courses in the traditional, interactive TV and/or computer-based training modes;
- appropriate evaluation materials; and
- technical competencies keyed to the learning objectives of the Technical Qualifications Program.

Although not a DOE specified program feature, web-based courses have been designed and introduced by the HBCU/MI Consortium. The expected outcomes of the TQP program, will be better technical evaluation and regulatory decision making, improved technical cost reductions, and more effective communication between the DOE contractor personnel, federal regulators and stakeholders.

Responding to the needs of the TQP/LADSs, the Consortium proposed to develop and deliver the following courses:

ENV 301-Environmental Geology I

Basic environmental geology, landforms, rock types, soil classifications.

ENV 302-Environmental Geology II

Hydrogeology; Basic principles and concepts of hydrology, hydrologic cycles, Aquifer types and hydrologic properties, physical laws and mathematical equations of subsurface flow; recharge and discharge; analysis of groundwater flow systems. Development of groundwater flow and contaminant transport models.

ENV 303-Environmental Geology III

Modeling, pollutant transport by groundwater; Hands-on computer modeling of surface and groundwater flow and subsurface contaminant transport; Analysis, evaluation and case studies.

ENV 310-Environmental Monitoring I

Statistics of environmental monitoring, sampling plans.

ENV 311-Environmental Monitoring II

Sample collection, quality assurance/quality control, chemical analysis, biological monitoring.

ENV 410-Environmental Regulations I

Environmental laws, enforcement, administrative procedures. Advanced discussion of environmental regulations of interest to DOE.

ENV 440-Environmental Chemistry

Reactions and fates of chemical substances in the environment, water treatment, atmospheric chemistry.

ENV 450-Waste Management Science

Chemical characterization of hazardous waste, transporting hazardous waste, chemistry of hazardous substances and wastes, environmental chemical processes, and toxicology.

ENV 451-Fundamentals of Waste Management

Hazardous and Radioactive Waste Management. Analysis and evaluation of technologies used for tracking, transporting and managing hazardous wastes.

ENV 471-Ecological Risk Assessment

Identifying ecological exposure units, developing contaminants of potential ecological concern lists, defining food webs, etc.

Education for an Environmentally Sustainable Future

A 1995 report on Sustainability in Higher Education indicates that meeting basic human needs now and in the future requires a major shift in the thinking, values and actions of all individuals and institutions in their relationship with the natural environment. The report concludes that this paradigm shift must be led by higher education institutions because they prepare most of the people who develop and manage society's institutions and who serve as teachers. The HBCU/MI Consortium concurs with this conclusion and, in 1996, through a partnership with a nonprofit environmental education organization, Second Nature, Inc., accepted the challenge of developing the knowledge, skills and strategies that could effectively make environmentally just and sustainable living "second nature" to the next generation.

Second Nature, Inc., whose mission is to advance human and environmental well being through learning at all education levels, is working towards the development of a worldwide citizenry that has the knowledge, skills, and values necessary to improve the health, well being and quality of life through the pursuit of just and environmentally sustainable community and economic development. Second Nature, Inc., facilitates the creation of regional partnerships between colleges and universities, governments, NGO's, industry and high schools. For the past three years, Second Nature, Inc., in partnership with the HBCU/MI Consortium, has provided a series of Partnership Leader Training Workshops for three to seven Partnership Leaders (PLs) from each of the seventeen Consortium member institutions. Partnership Leaders were faculty members from a variety of academic disciplines with strong educational skills who simultaneously have a strong commitment to using community resources to enhance environmental literacy. With the technical assistance of Second Nature, Inc., Partnership Leaders from the Consortium were prepared to initiate and conduct faculty development programs at their universities.

The Education for an Environmentally Sustainable Future Program was comprehensive and eventually included all disciplines. It integrated environment,

natural resource management and development knowledge, issues, problems, and values into the normal disciplinary teaching of the sciences, engineering, the social sciences, humanities, business, and the health professions at the college and university levels. These techniques avoided adding new requirements to already crowded curricula. It also gave students repeated exposure to environmental concerns, and helped them develop the environmental stewardship values and skills necessary for the practice of sustainability. This strategy is the most effective way to create the necessary paradigm shift and was accomplished for less than the cost of a text book per student.

A supplemental grant award to the Consortium from the Department of Energy provided funds to enhance the initial efforts of the HBCU/MI-Second Nature partnership. A Consortium wide competition was developed to solicit proposals from member institutions for the implementation of the Education for an Environmentally Sustainable Future agenda. A subcommittee was designated by the Consortium Steering Committee to develop a process and criteria to be used in the selection of six Education for Sustainability projects to serve as model programs of systems thinking and pedagogy and practice that support the movement towards environmental sustainability in higher education. An expert panel of national judges was identified through the Second Nature partnership to review proposals submitted by the member institutions.

Initially six grantees were selected. However, reallocation of funds allowed for a total of eleven institutions to implement Education for an Environmentally Sustainable Future activities in the three designated areas of Faculty Development, Community Outreach and Campus Stewardship. Activities to enhance Faculty Development include workshops, seminars, field trips, course revisions, assistance in accessing course materials, and sabbaticals or faculty exchange programs. Activities in the Community Outreach and Campus Stewardship areas refer to those which are focused on practicing environmental stewardship on the campus and the surrounding community and may include issues and activities such as recycling, clean-up operations, and

conservation of resources. The eleven model programs were implemented in 1996 and are tabled below by area(s) of speciality.

Focus of Education for Sustainability
Activities by Institution

	Faculty Development	Community Outreach	Campus Stewardship
Clark Atlanta	✓	✓	✓
Hampton	✓	✓	✓
Howard	✓	—	
North Carolina A&T		✓	
Northern Arizona	✓	✓	✓
Southern	✓	✓	✓
Texas A&M	✓	✓	
Texas Southern	✓	✓	✓
Tuskegee	✓		
UTEP	✓	✓	
Xavier	✓		

A web site was developed to chronicle the project. The address of this site is <http://galaxy.cau.edu/esproject/>. Included at the web site is a description of the project, a listing of participating institutions, and a calendar of events associated with the project. Each institution was encouraged to provide detailed information about their campus activities. An online forum was developed to encourage electronic dialogue on particular issues such as lead, radon and asbestos abatement and environmental health effects. Ultimately the syllabi and resource listings developed by individual faculty members will be shared through this site and case studies will be made available to the member institutions as well as to the greater community. A detailed report of each institution's efforts is available upon request from Dr. Collette M. Hopkins.

The Consortium and Second Nature, Inc., are working toward a world in which all professionals understand that the environment is the basis for all life and economic activity. Rather than being a competing interest, it is (as Peter Dunne of The New York Times has observed) the playing field on which all human activities compete. The vision is one in which:

Scientists, engineers, and business people should design technology and economic activities that sustain, rather than degrade, the natural environment, enhance human health and well-being, and mimic and live within the limits of natural systems. Economists and policy makers should create the incentives to make economic activity focus on creating meaningful jobs in an

environmentally just and sustainable manner by making market prices reflect the full cost of production, including the cost to the environment, to human health and to local communities.

All professionals should understand their connection to the natural world and to other humans globally, e.g., where products and services come from, where wastes go, and what wastes do to humans and other living species; that driving a car in Ohio may cause flooding in Bangladesh through global warming; or that cutting down rainforests in Brazil may deprive someone somewhere else in the world of a life-saving drug. Citizens should be able to discern real environmental risks to present and future generations and understand the complexities of dynamic, nonlinear processes that govern natural systems and many aspects of the socioeconomic system. They should ask the critical questions which would help prevent today's solutions from becoming tomorrow's problems. They should have the values to keep population levels within the carrying capacity of the planet and curb human material wants while helping to fully develop the potential of all humans through national and international cooperation.

EDUCATION FOR SUSTAINABILITY PROJECTS

Education for Environmental Sustainability

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