Bibliography to Inform COSEE’s Activities Related to Broadening Participation

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This bibliography provides an overview of resources (organizations, policy documents, research studies, intervention studies, etc.) that relate to broadening participation in the sciences. Resources are organized into the following sections:

Relevant Organizations & Web Resources

Research Literature
- Demographic Patterns of Diversity in the Sciences & Higher Education
- How People Learn in Diverse Communities
- Culturally Responsive Science Instruction—Effective Approaches to Educational Design
- Programmatic Approaches to Broadening Participation in the Sciences
- Culturally Reliable and Valid Program Evaluation
- Establishing Mutually-Beneficial Partnerships

Relevant Organizations & Web Resources

AAAS Center for Advancing Science and Engineering Capacity
http://php.aaas.org/programs/centers/capacity/

The Center provides institutions of higher education with assistance in achieving their educational mission in STEM fields. Drs. Shirley Malcom and Daryl Chubin and a large supporting cast of consultants at the Center are experts on diversity and capacity building to address the problem of under-representation. In addition to human resource development consulting, resources on the website include presentations, conferences and a catalog of policy-related research and insights.

BEST: Building Engineering and Science Talent
http://www.bestworkforce.org/publications.htm

BEST applies knowledge of program effectiveness in science, technology, engineering, and mathematics to support efforts to build capacity at the local, state, and federal levels. A variety of publications and reports are available, including: (1) What it Takes: Pre-K-12 Design Principles to Broaden Participation in Science, Technology, Engineering and Mathematics”; (2) A Bridge for All: Higher Education Design Principles to Broaden Participation in Science, Technology, Engineering and Mathematics; (3) The Talent Imperative: Diversifying America’s Science and Engineering Workforce; (4) Quiet Crisis: Falling Short in Producing American Scientific and Technical Talent

Center for Research on Education, Diversity & Excellence (CREDE) Bibliography
http://crede.berkeley.edu/products/print/books.html

This bibliography lists books either written by or recommended by CREDE researchers. Books are grouped by topic: language learning and academic achievement; professional development for diversity; schools, families and community; instruction; school reform; and assessment.

LIFE Center Diversity Panel: Consensus Report & Presentations
http://life-slc.org/panel/

Learning in Informal and Formal Environments (LIFE) Center convened two panel events to understand and take into account different forms of learning supported in various contexts, activities, and cultures. Video of the presentations are available on the website, as well as the LIFE Center consensus report, "Learning In and Out of School in Diverse Environments: Life-Long, Life-Wide, and Life-Deep" for download or hardcopy purchase.


The conferences addressed building institutional capacity; sustaining partnerships between the public and private
sectors; and exchanging scientific information among NOAA and the minority-serving institution (MSI) community.

NOAA Educational Partnership Program
http://www.epp.noaa.gov/
The goal of NOAA’s Educational Partnership Program is to increase the number of students from underrepresented communities who are educated, trained and graduated in fields that directly support NOAA’s mission.

http://www.understandinginterventions.org
This conference brings together researchers who are looking at increasing minority participation in the STEM research pipeline and careers. Conference reports and a 2007 workshop summary of methodological approaches are available. Daryl Chubin is vice chair of this group of social scientists, educational researchers and STEM practitioners.

NSF Science and Engineering Indicators
Science and Engineering Indicators, published by the National Science Board, provides a broad base of quantitative information on the U.S. and international science and engineering enterprise. Statistical categories include education at the various levels, labor force, trends in research and development, public attitudes and understanding, and state statistics, and are updated annually.

Quality Education for Minorities Network
http://www.qem.org/
The Quality Education for Minorities (QEM) Network is a non-profit organization based in Washington, DC, dedicated to improving the education of African Americans, Alaska Natives, American Indians, Mexican Americans, and Puerto Ricans. Millions of dollars, now spent for remedial purposes, could be made available for the educational benefit of all children and youth by improving the quality of education available to the groups targeted by QEM. Quality education for minorities improves the quality of education for all.

NSF 2009 Joint Area Meeting
http://www.nsf.gov/events/event_summ.jsp?cntn_id=112343&org=HRD
The NSF Division of Human Resource Development (HRD) within the Directorate for Education and Human Resources announces its 2009 Joint Annual Meeting (JAM), to be held at the Omni Shoreham Hotel in Washington, DC from June 8th to 11th, 2009. HRD is pleased to welcome the NSF's Directorate for Biological Sciences (BIO) as a co-sponsor for JAM09. Each year, HRD grantees gather in Washington, DC to discuss, present, network, leverage expertise, and create connections to the many other research and education projects funded within the division.

Institute for Broadening Participation
http://www.ibparticipation.org/
The Institute for Broadening Participation (IBP) is a non-profit organization created to design and implement strategies to increase access to STEM (Science, Technology, Engineering, and Mathematics) education and careers for diverse underrepresented groups. IBP's Mission is to (a) make education and careers in science more accessible to students - particularly to members of underrepresented groups, (b) support faculty and administrators as they work to include students from a variety of backgrounds in their programs, and (c) foster an on-going exchange of ideas and resources between individuals and institutions who are working to navigate their future in the STEM fields.

NSF Broadening Participation Resources
http://www.nsf.gov/od/broadeningparticipation/bp.jsp
Summarizes resources associated with NSF’s commitment to broadening participation is embedded in its Strategic Plan through a variety of investment priorities related to the Learning and Stewardship strategic outcome goals.
http://www.eval.org/

AEA is an international professional association of evaluators devoted to the application and exploration of program evaluation, personnel evaluation, technology, and many other forms of evaluation. Evaluation involves assessing the strengths and weaknesses of programs, policies, personnel, products, and organizations to improve their effectiveness. Resources include conferences, bibliographies, and network of consultants.

Research Literature

Demographic Patterns of Diversity in the Sciences & Higher Education

Notable resources:


Data from survey of 872 African-American students at predominantly white colleges and 928 at historically black colleges suggest that academic achievement is highest for students who have higher educational aspirations, positive faculty relationships, confidence in their college choice. Beyond individual characteristics, academic performance is affected by such factors as campus quality of life, racial relations, social support networks.


This paper presents data covering the representation of African Americans among physics and geoscience degree recipients at each stage of the educational system. The data were collected by several statistical agencies. This paper presents a snapshot of the supply side of physics and the geosciences and places the education of African American physicists and geoscientists within the larger context of the educational system and social structural barriers some students must circumvent. The paper identifies institutions that have reduced or removed these barriers, highlights striking contributions of Historically Black Colleges and Universities (HBCUs) in supplying the scientific workforce of African Americans, lists departments that have been successful in attracting and retaining African American students, to use as role models. See page 11 in particular for a Table on BS granting departments in the geosciences at HBCUs.


A conceptual framework that integrates critical gender theory and a multicultural approach is used to examine young African American women's experiences in high school science. Quantitative and qualitative data are used to explore the family's role in the science attainment process. Findings show that these young women feel less welcome in science than do young White women. However, their interest and involvement in science persist because of the family. Both mother's and father's influence is important. Although family variables are associated with success in science in the quantitative data, not all young women acknowledge or verbalize their awareness of this influence in the qualitative data. Instead, the young women often see their actions as independent.

Additional Resources:


Demographic statistics for undergraduate and graduate degrees awarded to women and minorities in the United States in 1995, with trend data from 1985-1995.

**How People Learn in Diverse Communities**


The major assumption of this consensus report is that if educators make use of the informal learning that occurs in the homes and communities of students, the achievement gap between marginalized students and mainstream students can be reduced. A cultural approach to learning recognizes, respects and mobilizes the range of experience, knowledge, cultural practices, languages, and community sources of support that people bring from their varied socio-economic and historical contexts. It focuses on four principles as underpinnings for Life-long (acquisition of fundamental behaviors and real-world information), Life-wide (breadth of experience), and Life-deep (embraces religious, moral, ethical, social values and judgment; language is key here) learning concepts. These principles explore why these concepts should be used in schools and across other educational organizations.


This article seeks to extend our understanding of the learning processes that occur within and at the intersection of diverse world views and knowledge systems, drawing on experiences derived from across Fourth World contexts, with an emphasis on the Alaska context in particular. Problem/challenge in engaging students of Indigenous societies is their aversion to an alien institutional culture. The curricula, teaching methodologies, and assessment strategies need to be based on a worldview that adequately recognizes or appreciates the worldview of the population (e.g., notions of an interdependent universe and the importance of place in their societies). Necessary to devise a system of education for all people that respects the epistemological and pedagogical foundations provided by Indigenous as well as Western cultural traditions, identifying common ground between the two knowledge systems.


This chapter argues that participation and achievement in science are mediated by a complex set of sociocultural and systemic factors not often recognized in science equity efforts. A synthesis of four commonly researched groups (gender, Native American, people with disabilities, urban and rural environments) illustrate common themes that underlie the experiences of individuals with varied cultural and historical backgrounds. Outreach programs and designed spaces environments should be developed in ways that expressly draw upon participants’ cultural practices, including everyday language, linguistic practices, and common cultural experiences. Members of diverse cultural groups can play a critical role in the development and implementation of programs, serving as designers, advisers, front-line educators, and evaluators of such efforts.

This article addresses a challenge faced by those who study cultural variation in approaches to learning: how to characterize regularities of individuals’ approaches according to their cultural background. By focusing on the varied ways people participate in their community’s activities, we can move away from the tendency to conflate ethnicity with culture, with assignment to ethnic groups made on the basis of immutable and often stable characteristics. A cultural-historical approach focuses researchers’ and practitioners’ attention on variations in individuals’ and groups’ histories of engagement in cultural practices because the variations reside not as traits of individuals or collections of individuals, but as proclivities of people with certain histories of engagement with specific cultural activities. Thus, individuals’ and groups’ experience in activities—not their traits—becomes the focus.


This paper argues that to generate robust and generative theories of human learning and development, researchers must address the range of diversity within human cultural communities, in cognitive, social, physical and biological dimensions, in other words, creating an ecological focus. The article theorizes the relationship between culture and learning in terms of the underlying mechanisms that help to explain how culture operates both to facilitate and to constrain learning. Theories of learning must help us to understand the ways that identity is linked to goal setting and persistence; the ways that competence is very much context dependent; how the exercise of power and the availability of resources can affect opportunity to learn; and how socialization efforts can help youth learn to make sense of and resist those institutional structures and practices that constrain and impede their opportunities to learn. Attention to the meaning of cultural practices within particular communities is crucial so that we are not imposing normative assumptions that have no meaning for the people we are studying.


In this chapter, the authors argue that learning and teaching are fundamentally cultural processes, in which learning and development consists of diverse repertoires of overlapping, complementary or even conflicting cultural practices. A cultural view of learning encompasses adaptive expertise involving the development of flexible knowledge and dispositions that facilitate effective navigation across varied settings and tasks. An expanded view of what counts as scientific thinking and activity – including use of embodied imagining, argumentation, and metaphor for the purposes of theorizing and knowledge building, allows us to see robust, authentic connections between the everyday knowledge and practices of youth from non-dominant groups and those of academic disciplines. We must look beyond the typical connections made in school curricula and identify important continuities of practice. The paper examines characteristics of learning as people go about everyday lives, the specific ways these various repertoires of practice connect with academic practices and how these repertoires can be recruited in educational opportunities and designs.

**Culturally Responsive Science Instruction—Effective Approaches to Educational Design**

**Notable Resources:**


This book provides a comprehensive overview of humanistic approaches to science, approaches that connect students to broader human concerns in their everyday life and culture. Summarizes major worldwide historical findings, focuses on present thinking, and offers evidence in support of classroom practice. The text describes an approach to teaching science (grades 6-12) that animates students’ self-identities covering curriculum policy, teaching materials, teacher orientations and teacher education, student learning, culture studies, and future research.

How might science education reflect the values of a socially just and democratic society? An engaging look at several after-school science programs that have turned into community-building experiences. This book presents a combination of in-depth case studies and rigorous theory, this volume offers a series of teaching stories that describe inner city youth's practices of science.


Explores a form of "connected science" in which real world problems and school-community partnerships are used as contextual scaffolds for bridging students' community-based knowledge and school-based knowledge as a way to provide all students opportunities for meaningful and intellectually challenging science learning. The potential of these scaffolds for connected science is examined through a case study in which a team of fifth-grade teachers used the student-identified problem of pollution along a nearby river as an interdisciplinary anchor for teaching science, math, language arts, and civics.


This edited volume explores the impact of social identity (race, class, gender, sexual orientation, religion and so on) on teaching and learning. Operating within a realist framework, the contributors to this volume (all of whom are minority scholars) consider ways to productively engage identity in the classroom and at the institutional level, as a means of working toward racial democracy in higher education. As realists, all authors in the volume hold the theoretical position that identities are both real and constructed, and that identities are always epistemically salient. Thus the book argues--from diverse disciplinary and educational contexts--that mobilizing identities in academia is a necessary part of progressive (antiracist, feminist, anticolonial) educators' efforts to transform knowledge-making, to establish critical access for minority students to higher education, and to create a more just and democratic society.


Although focused on literacy, this is a highly developed culturally responsive model for disciplinary learning grounded in detailed empirical research on learning. The Cultural Modeling Project, which she presents here, drew on competencies students already had in African American Vernacular English (AAVE) discourse and hip hop culture to tackle complex problems in the study of literature. Using descriptions from classrooms, she describes how AAVE supported student learning and reasoning; how students in turn responded to the reform initiative, and how teachers adapted the cultural framework to their curriculum.


Describes the centrality of culturally relevant pedagogy to academic success for minority students who are poorly served in public schools, discussing linkages between school and culture, examining the theoretical grounding of culturally relevant teaching in the context of a study of successful teachers of black students. Provides examples of culturally relevant teaching practices.


These collected papers examine the sociocultural approach to curriculum design, which provides minority and working class students with instruction that puts their knowledge and experiences at the heart of learning. It presents the theoretical framework for linking students' lives with curriculum and specific strategies from teachers who have done so successfully. The stories show African American, Haitian American, Hispanic American, Native American, and rural white students in contextualized learning as they do reading, writing, mathematics, and science across the grades. All of the classrooms use students' household-based funds of knowledge as resources for school-based funds of knowledge, building bridges in nontraditional ways.


Offers a perspective on understanding the gap in science learning and achievement that separates low-income, ethnic minority children from more economically privileged students. Discusses how the relationship between everyday and scientific knowledge and ways of knowing has been conceptualized in the field of science education research. Considers two dominant perspectives, continuous and discontinuous relationships.

Additional Resources:


Parsons, Eileen Carlton. Culturalized science instruction: Exploring its influence upon black and white students’ achievement.


Programmatic Approaches to Broadening Participation in the Sciences

Notable resources:


Charette participants explored strategies to enhance academic attraction to the ocean sciences. They explored the possibilities of using the coastal heritage and other historically related issues as an additional strategy to introduce African American students to the ocean sciences field.


This panel discussion focused on strategies to increase minority participation at marine laboratories and in marine sciences. Panelists included: Dr. Benjamin Cuker, Hampton University; Dr. Brian Bingham, Western Washington University; Dr. Bradford Brown, NOAA Fisheries and President of the Miami-Dade chapter of the NAACP; Dr. Judith Vergun, Oregon State University; and Dr. Dionne Hoskins, NOAA Fisheries, Galveston and Savannah State University.
Guidelines for NSF’s drive to increasing diversity as related to proposal review criteria for intellectual merit and broader impacts. The report addresses strategies for diversifying the reviewer pool, training NSF staff and reviewers on broadening participation, enhancing accountability, communicating guidance and promising practices on broadening participation, and maintaining a portfolio of relevant programs.


This report suggests ways to increase the number and diversity of those pursuing education and careers in science, technology, engineering and mathematics (STEM). The authors analyze why successful individual reform efforts have not led to broader increases in students achieving at high levels nor entering science and math oriented careers and identifies three components necessary to increase success in quantitative sciences: engagement, capacity and continuity.

Additional Resources:


**Culturally Reliable and Valid Program Evaluation**

*Notable resources:*


This volume seeks to address select questions drawn from the matrix of the complex issues related to culturally responsive evaluation. Should evaluation be culturally responsive? Is the field heading in the right direction in its attempt to become more culturally responsive? What is culturally responsive evaluation today and what might it become tomorrow? In preparing evaluation tools and analysis, caution must be exercised around existing belief systems that may influence indicators of success, validity or bias. Two chapters are of particular note: (1) Johnson, Elmima. The use of contextually relevant evaluation practices with programs designed to increase participation of minorities in science, technology, engineering, and mathematics (STEM) education; (2) Nelson-Barber, S., LaFrance, J., Trumbull, E., & Aburto, S. Promoting culturally reliable and valid evaluation practice; pages 217-235.


Culturally competent evaluation in Indian Country requires an understanding of the rich diversity of tribal peoples and the importance of self-determination and sovereignty. If an evaluation can be embedded within an indigenous framework, it is more responsive to tribal ethics and values. An indigenous orientation to evaluation suggests methodological approaches, a partnership between the evaluator and the program, and reciprocity.

From the vantage point of indigenous peoples, the term "research" is inextricably linked to European imperialism and colonialism. A framework for an indigenous research agenda is set out that encompasses the processes of decolonization, healing, mobilization, and transformation within four community statuses: survival, recovery, development, and self-determination. Numerous examples of indigenous research projects in New Zealand and North America, including projects concerned with education and language maintenance, demonstrate the ways in which an indigenous research agenda is being articulated and indigenous knowledge is being validated.


These proceedings serve as a reference point for the Directorate as it builds capacity within the field of educational evaluation. The workshop focused on two themes, around which the report is organized: Academic achievement by underrepresented minorities; and Training and participation of minority professionals in the evaluation of mathematics and science programs.


This workshop was aimed at increasing the supply of minority evaluators for science and mathematics, developing a network to identify and share information about available resource materials, compiling lists of Native American evaluation professionals and identifying training and educational opportunities. Themes centered around: Evaluation issues relating to the academic achievement of Native American students; education/training opportunities for Native American evaluators; and developing, maintaining and expanding a network of Native American evaluators.

*Additional Resources:*


Establishing Mutually-Beneficial Partnerships


In striving to create authenticity in a novel curricular structure, a ‘mutual benefit partnership’ developed in collaboration with a telecommunications company and four middle schools. The partnership created products of value to the corporate partner as well as to the teachers and students. But attempts to provide significant benefits to all parties of the partnership brought out conflicts in cultural values between school and corporate communities, resulting in both learning opportunities and risks to participants. Mutual benefit from students’ work resulted more from ancillary (or secondary) products of their work than from primary products, suggesting the need to design curricular structures to achieve joint focus of school and corporate participants on the primary products of student work.