

The National Community College Conversation
What Does It Mean To Be Educated in the 21st Century?

May 19-20, 2005

Hosted by
Mesa Community College
Mesa, Arizona

Report to the National Science Foundation
June 2005



Introduction

Mesa Community College (MCC) hosted the national community college conversation to discuss what it means to be educated in the 21st century on May 19 and 20, 2005. The event was one of a five-part series of national conversations sponsored by the Directorate for Education and Human Resources of the National Science Foundation (NSF). Seventy-two attendees including faculty and administrative leaders and stakeholders representing business and industry, foundations, and higher education institutions (primarily community colleges) participated in the two-day conversation at MCC. Rosemary Haggett, director of the Division of Undergraduate Education, represented NSF at the event. The other four institutional partners were Syracuse University (representing research intensive institutions), Project Kaleidoscope (representing comprehensive/liberal arts colleges), North Carolina A&T University (representing minority serving institutions), and the University of Texas at El Paso (representing Hispanic-serving institutions).

Mesa Community College, the largest of the ten colleges in the Maricopa Community College District, has been a leader in the national discourse on the role of community colleges today and into the future. As a starting point for developing an approach to the conversation, the college planning team used the NSF-defined four common goals:

- To stimulate thinking about science literacy and what it means to be educated in the 21st century;
- To set this thinking about science and science literacy in a global context;
- To convert results of these discussions into a consideration of what changes are needed at the K-12/college nexus and in undergraduate education;
- To modify NSF solicitations accordingly.

The MCC planning team also developed a set of five outcomes expected to result from the conversation and aligned with the NSF goals; these outcomes are the following:

- Generate new thinking from diverse constituencies about “what it means to be educated in the 21st century.”
- Formulate new ideas about the implications of “what it means to be educated in the 21st century” for the future of community colleges, as well as for the future of science, technology, engineering, and mathematics education.
- Be the voice for community colleges in this series of national conversations.
- Generate recommendations that will inform future discussions, directions, and funding priorities for the National Science Foundation, Division of Undergraduate Education
- Prepare a document of findings from the conversation for dissemination to the National Science Foundation and the larger community

Methodology

The planning and organization of this event was led by Gail Mee, Vice President for Academic Affairs at MCC and Principal Investigator for the NSF grant and Liz Dorland, Chemistry faculty member, former NSF program officer, and co-PI for the project. An eight-member faculty team

was formed in late fall 2004 to provide advice and serve as a resource for conversation planning, facilitation, and analysis of the results. Two instructional deans also assisted with planning, facilitation, and report writing. (See Appendix A for list of planning team members.)

MCC's planning team wished to have a diverse group of attendees participate in the conversation – diverse geographically and in terms of their roles in higher education and the private and public sectors; balanced in gender, race and ethnicity; and bringing a wide range of perspectives and expertise, not just about science, technology, engineering and mathematics, but about the broader issues facing higher education (See Participant Directory in Appendix B.)

Information about the conversation, as well as a list of readings and other relevant information, were posted on the MCC conversation website (www.mc.maricopa.edu/nsf). Participants were asked to read at least one of the articles or reports posted on the readings page in preparation for the conversation. (See list of readings in Appendix C.)

The one-and-a-half day conversation was designed around three themes and three question sets intended to stimulate substantive thinking, conversation and recommendations from attendees.

The three themes were:

- the global and social context and issues that will influence and impact higher education;
- the characteristics and expectations of students in the 21st century, particularly community college students;
- the future of science, technology, engineering and mathematics education in the community college.

The agenda was structured to include one session for each of the three major themes, each session commencing with a speaker. (The program for the conversation is included in Appendix D.) The first session began on Thursday morning (May 19), the second session was held on Thursday afternoon, and the third on Friday morning (May 20). A set of questions based on the theme formed the basis for the discussion at each session; discussions were facilitated by MCC faculty members who had served on the planning advisory team. Speakers and report-out sessions were taped and video recorded. A dinner on Thursday evening included a cultural presentation and table discussions of the major concepts that had emerged during the day.

The basic structure for each of the three sessions involved the following:

- An opening speaker to provoke thinking and conversation;
- Eight discussion tables, with participants assigned to groups to maximize diversity of roles and thought;
- Round table facilitated discussions based on the question sets;
- Approximately 90- minutes for discussion and 45- minutes for report-out;
- Recording of major ideas by each group on flip charts;
- Report-out with each table summarizing key concepts or findings for each of the questions;
- Report-outs recorded on a projection system so the information could be viewed by all participants as the report-outs progressed, and results handed out at the following session.

During a final concluding session, participants generated major themes from the conversation, recommendations to NSF related to future directions and funding priorities for community colleges, and actions to be taken next.

Conversation Speakers

Three distinguished speakers provided perspectives that were crucial to the success of the conversation: Clara Lovett, President of the American Association for Higher Education; Debra Humphreys, Vice President for Communications and Public Affairs at the American Association of Colleges and Universities (AAC&U); Mel George, President Emeritus of St. Olaf College and the University of Missouri. The speakers were also participants in the conversation. (See biographical sketches in Appendix E.)

Clara Lovett's opening talk focused on global and social issues that will influence and impact higher education, setting the stage for the initial phase of conversation. Dr. Lovett's presentation, "Learning to Focus on What Matters: Higher Education and the Challenges of a Global Society," addressed issues such as the explosion of knowledge and its impact on the curriculum, the impact of technology, global perspectives such as outsourcing and economic inequities, and fundamental issues related to the organization of the academy. She addressed how current organizational structures, such as disciplinary and departmental silos, can present almost insurmountable barriers to change in higher education. She concluded her remarks with an examination of the need to become less dependent upon natural resources and military power and more dependent on the development of people and intellectual capital.

Debra Humphreys' presentation, "Greater Expectations: The Nation Goes to College," provided a context for the second theme, namely, who college students will be and what will be their expectations. She shared recent statistics and focus group results from the AAC&U as well as a summary of the Greater Expectations vision for the empowered, informed, and responsible learner. For example, currently 73% of undergraduates are "non-traditional" in some way, college students are mobile across institutions with a large majority attending two or more colleges, and many students are entering college less academically prepared.

Students participating in a series of focus groups were asked to rank their most and least critical results of a college education. Consistently across the groups, students ranked building "life skills" such as time management and business skills as their top objectives, while ranking interest in civic engagement, the sciences, and cultural perspectives as least critical. In essence, the data suggest a significant gap between the expectations of future college students and the directions prescribed by most educational reform movements.

Mel George opened the second day of the conversation with his address titled "Beyond Shaping the Future: Directions for Higher Education and the New Workforce" and provided a context for the third theme of issues confronting science, technology, engineering, and mathematics education in community colleges. Drawing on recommendations from the Shaping the Future report, current learning research, and recent discussions of the National Research Council, George provided a fresh way of thinking about expectations for what students should learn. He posited that expert thinking, complex communication skills (e.g., the ability to negotiate, the

ability to listen and change one's mind), using patterns to solve new or non-routine problems, and reflecting on one's own thinking will be the skills necessary for the future, regardless of the content discipline. Furthermore, he argued for bridging the gap between research and practice in higher education and for the pivotal role of effective assessment in developing desired student learning outcomes.

Conversation Results

The three question sets were designed to flow from the general to the specific – i.e., social and global perspectives, community college students and issues, STEM in the community college. Within each question set were three specific questions to be addressed by the discussion groups; the third question was intended to result in specific recommendations about that area. The question sets and questions were structured as follows:

Question Set #1, Thursday Morning (Global and National Perspectives on Higher Education)

- A. *What societal and global perspectives and issues can we anticipate that will impact higher education in the 21st century?*
- B. *Within that societal and global context, what knowledge, skills, and attitudes will an educated person need to possess?*
- C. *To what extent is higher education now addressing the knowledge, skills and attitudes that you have identified? What do we need to do differently?*

Question Set #2, Thursday Afternoon (Community College Students and Issues)

- A. *Who will be community college students of the 21st century?*
- B. *What expectations will they have for their educational experiences? How will we address their expectations?*
- C. *In light of this discussion and the set of knowledge, skills, and attitudes addressed in the morning session, what changes in community college curricula and pedagogy will be necessary?*

Question Set #3, Friday Morning (Community College STEM and NSF Issues)

- A. *The National Science Foundation is sponsoring this conversation. What knowledge, skills, and attitudes that you identified yesterday pertain to science*, technology, engineering, and mathematics (STEM) education? (*Science is broadly defined to include physical, life, and social sciences.)*
- B. *Considering the lack of participation and success among community college students with STEM subjects, what efforts and reforms have worked in the past? What do community colleges need to do differently in the future?*
- C. *In light of the above discussion, what recommendations should we make to NSF about future community college funding priorities?*

Discussion Results - Question Set #1 (Global and National Perspectives on Higher Education)

A. What societal and global perspectives and issues can we anticipate that will impact higher education in the 21st century?

Global perspectives on politics, social issues, and the economy will both influence and require changes in education. Within the United States, there seem to be considerable misunderstandings within the U.S. about the rest of the world and other cultures. Building an awareness of the interconnectedness of the world is increasingly important, including awareness of issues related to cultural respect and understanding of international dynamics. Changing demographics will continue to impact this global society, and educators have a responsibility to help students look at the world through different lenses.

The population will continue to grow and more students will need access to education. At the same time, it appears that funding will continue to erode. Participants expressed a perception that there is a diminishing value for, and an increasing skepticism toward, education by the general public. Furthermore, the political climate in the educational arena is increasingly negative, accompanied by erosion of funding. Some of the major factors that are expected to warrant change have implications that are value-laden – ethics, spirituality and morality. For example, as biotechnology comes to the forefront of science, important ethical and moral issues will need to be understood and discussed.

There are forces that lead us to change, technology being perhaps the most profound example. Because of technology the world is more connected and information can be shared more quickly. Ironically, some of our most challenging barriers to change are due to disconnections – among institutions, among cultures, between generations – which slow down change. New ways of thinking about these challenges are needed to break the barriers.

B. Within that societal and global context, what knowledge, skills, and attitudes will an educated person need to possess?

The educated person must have a global perspective of knowledge, be adaptable, have a holistic (i.e., interdisciplinary) view, and hold positive attitudes toward learning. The well-nurtured and educated individual should realize the global effects of personal actions and the interplay among social, economic, and environmental factors. Necessary knowledge and skills should include interpersonal communication, empathy for those outside their comfort zone, negotiation skills, global literacy, ability to work as a team, understanding of sustainability, and technology fluency and fluidity. Content should be approached with an interdisciplinary vision.

Thinking and learning should involve intellectual agility and fluency, adaptability, and the broad application and integration of knowledge. A key aspect of learning should be centered on inculcating attitudes as well as developing skills and abilities – this means getting students excited, empowering them to be change agents, developing a sense of empathy, instilling hope and a belief that learning is a life long commitment. Students need to develop a keen awareness

of sustainability issues involving economic, social, and ecosystem health issues. An example of a possible change would be to move the diversity discussion to a higher level, developing the knowledge, skills, and attitudes necessary for global literacy.

Our faculties are essential to enabling these changes to occur, as are planners and policy makers. But many believe that graduate schools are not adequately preparing future faculty to teach the new skills, knowledge and attitudes. Letting go of old beliefs of teaching and learning are important and necessary attitudinal changes for faculty. And policy makers seem to be retrenching rather than innovating in the educational arena, even acting as adversaries to change.

C. To what extent is higher education now addressing the knowledge, skills and attitudes that you have identified? What do we need to do differently?

We in higher education are doing many positive and innovative things now as separate bodies. However, in order to address more systemically the future of the educated person and our vision as educators, we engaged in this national conversation. This requires us to examine what we can do differently and better.

First we looked at the entire change agenda and processes for change, which include:

- Developing consensus and buy in;
- Embracing inclusiveness and the responsibility of everyone ;
- Determining what current structures and processes prohibit or inhibit change ;
- Recognizing the need to change, dealing with any resistance, and implementation;
- Creating effective partnerships and eliminating boundaries.

The changes we seek as educators do not seem to occur, or they do not occur throughout our systems. A systematic re-examination of how and what faculty teach, how students learn, what support mechanisms exist, and how context or environment is organized and function needs to be in place.

A number of tangible actions were identified for what can be done differently. These include finding leaders with vision, improving faculty development, hiring faculty with 21st century skills and an interdisciplinary orientation, re-examining disciplinary and departmental structures as well as the curriculum, and creating reward systems for cooperation and for change outside the formal structures.

Discussion Results - Question Set #2 (Community College Students and Issues)

A. Who will be community college students of the 21st century?

As community colleges, we have a tremendously diverse range of students — traditional and non-traditional, prepared and under-prepared, degree- and certificate-seeking and recreational, native and international, disenfranchised and re-careering, stop-out and multi-tasking students, visual and technologically literate students, and so forth. As current economic and social pressures increase, community college students will grow in numbers and diversity of interest, expectations, and needs. Students will take a more active role in the design of their courses or program tracks. Community colleges must be ready to respond to this range of diversity; for example, more may be likely to offer bachelor degrees.

B. What expectations will they have for their educational experiences? How will we address their expectations?

There will be increasing diversity of student expectations, and community colleges will address a wide and changing range of needs. Students will expect speed, efficiency, flexibility, and the opportunity to learn at a distance. They will want more flexibility in format (“24/7”), options in scheduling (anytime, anyplace, anywhere, any pace, fast tracks), more refined alternative delivery of instruction, and better access. Students will expect and demand efficient use of their time in learning.

Students will have high expectations for accountability and relevance of courses and programs. For example, cutting edge, interdisciplinary and practical course content and activities are assumed. Students will expect to learn about technology and how to use the latest technology. Students expect outcomes from courses and programs to be directly related to careers and post-graduate goals. Many students will be pursuing specific credentials that are practical and will lead to employment.

Currently, many students still expect to be receptacles of knowledge and not independent learners. This expectation is in tension with some of the more lofty directions of higher education change agendas that include civic engagement, interdisciplinary connections, and global awareness. Therefore, it is imperative that faculty redefine teaching and learning for students as well as for themselves.

C. In light of this discussion and the set of knowledge, skills, and attitudes addressed in the morning session, what changes in community college curricula and pedagogy will be necessary?

Changes are necessary in three core areas: assessment, curriculum, and pedagogy.

We need to assess conceptual learning that we are trying to instill in students, rather than assessing for surface knowledge. Scenario and experiential learning, for example, will require innovative and different forms of assessment. We need to examine what we are assessing more

closely. If we begin with the expected outcomes that we believe to be important for an educated person, the curriculum and approaches to assessment will be altered.

In order to develop a new curriculum that is interdisciplinary, evolving, responsive, and relevant, we will be required to make structural changes to our systems. We will need to have meaningful discussions with employers that lead to meaningful curricula and connect content to a global perspective. The curriculum should be more connected and cohesive. For example, biotechnology is an interdisciplinary field of study that includes the technology industry, life science curricula, social science issues, as well as research and development in a global context.

The new pedagogy should be adaptive and transformational for faculty and students, creating an experience of total engagement between materials, student, and instruction. Students should be actively engaged in finding multiple solutions to real-life problems. Total engagement between faculty and student with the material would create a fluid and interwoven learning experience among the three.

In order to accomplish this new pedagogy, faculty development and changing students' attitudes toward and about learning are paramount. Successful practices need to be institutionalized, sustained, and modeled. Areas such as technology literacy, sustainability literacy, improved interaction among faculty and students, and transformative teaching will need to be infused in student and professional development efforts.

Discussion Results - Question Set #3 (Community College STEM and NSF Issues)

A. The National Science Foundation is sponsoring this conversation. What knowledge, skills, and attitudes that you identified yesterday pertain to science*, technology, engineering, and mathematics (STEM) education?

****Science is broadly defined to include physical, life, and social sciences.***

Students need to be able to apply technical information and skills to real world and global situations. Students should be able to explain and apply their understanding of science and mathematics to other fields. Digital competencies are increasingly important. Students need intellectual fluency and agility, the ability to deal with ambiguity, and an inherent sense of curiosity.

Attitudes toward mathematics and the sciences need to be improved. Too many students view them as a lethal combination of irrelevance and difficulty; they do not see the significance of mathematics and the sciences as integral to their learning or to a global society. Unfortunately, these negative attitudes are sometimes reinforced by faculty. More attention needs to be given to making STEM more relevant, meaningful, and achievable to everyone.

Soft skills such as negotiating, team work, integrative and interdisciplinary thinking could serve to remedy misperceptions and negative perceptions about both learning and teaching in the STEM disciplines.

B. Considering the lack of participation and success among community college students with STEM subjects, what efforts and reforms have worked in the past? What do community colleges need to do differently in the future?

A number of STEM efforts and reforms have worked in the past. Some noted by participants include mentoring programs, particularly for minority students; creating meaningful student connections to college life; tutoring; cooperative learning, project-based learning, and learning communities; the teaching scholars partnership; and designing facilities to promote more interaction between students and faculty. Institutions that have implemented successful STEM initiatives have incorporated administrative support, supported faculty development, recruited innovative faculty, and changed the culture of teaching.

Notwithstanding these efforts and the success of particular programs to improve STEM education in the community college over the past decades, total systemic reform has not occurred. Significant changes still are needed at multiple levels within our systems – these include individual, organizational, and policy levels.

Suggestions for changes at the individual level include changing the perception among both students and faculty that there is “only one right answer” and learning more about student and individual needs.

At the organizational level, quality needs to be stressed rather than quantity (i.e., more depth, less breadth), and effective models need to be created for sharing best instructional practices, resources, and innovative assessment practices. Interdisciplinary integration is seen as critical. For example, communication skills should be imbedded in the sciences and mathematics curricula, and scientific literacy should be infused across the curriculum. We need to invest in faculty development and recruit innovative new faculty who bring the desired 21st century skills and knowledge to the classroom.

In addition, policy makers need to be educated about science and mathematics reform needs. Too often, important policy issues are being decided by people who are themselves scientifically illiterate.

C. In light of the above discussion, what recommendations should we make to NSF about future community college funding priorities?

NSF's role has been and will continue to be critical to higher education reform in the STEM disciplines, and participants expressed considerable concern over diminishing federal dollars to support reform efforts.

- When funding, think long-term infusion and commitment.
- Replicate the NSF Conversations at local and regional levels to reach a wider audience.
- Increase funding for integration between research and practice and increase relationships between the research and teaching communities.
- Renew funding for the Distinguished Teaching Scholars and other exemplary programs.
- Invest in practices we know work.
- Bring assessment to the forefront as a funding priority (e.g., review of STEM content and curricula in light of learning outcomes, assessment tools and methods).
- Fund programs that integrate STEM with other disciplines and with the applied STEM community.
- Strengthen connections and communication between community college faculty and NSF.
- Facilitate process to identify and synthesize criteria for effective teaching.
- Fund studies to examine STEM instruction in community colleges, especially the STEM courses that are gatekeeper courses, in order to determine how to improve students' first level experiences.
- Fund teacher education/preparation programs.
- Fund development of multi/interdisciplinary curricula and instructional approaches.
- Provide funding for developmental needs and for mentoring for students and teachers.

Conclusions and Recommendations

The final session of the conversation focused on identifying major themes, and participants surfaced a number of compelling themes to share with NSF. At the conclusion of the conversation, they were both realistic and hopeful about the state of the fiscal, social, and political challenges affecting our institutions and systems – hopeful that a recasting of resources, structures, and energy of the past could lead to meaningful solutions for the future. Most recognized the need for continuing the conversation at all levels – locally, nationally and globally – and they generated a number of themes to sustain that discussion.

Five major themes emerged from the conversation:

Systemic Change: The corporate sector views the potential shortage of knowledge workers as a national emergency, and many believe we are losing our “competitive edge.” Yet the response from higher education is slow and possibly imperceptible to those outside the system. Isolated, episodic, or incremental changes are insufficient.

Organizational Structures: Institutions of higher education continue to operate within a rigid structure of departments and disciplines. Preparing learners for the knowledge age requires thinking, teaching and learning outside and across these content “silos.” If we are to create meaningful programs of study for students that cross disciplinary lines, we need to seriously examine the fundamental structure of our organizations.

Integration of Content and Soft Skills: We cannot continue to view course content and “soft skills” as unrelated, separate, or discrete. The ability to communicate, solve new problems, negotiate, and listen are not content dependent, but they are inextricably interwoven with content and should be integrated throughout the curriculum.

Assessment of Student Learning: Assessment is a critical component to realizing the student learning outcomes for the 21st century. Assessment allows educators to more accurately define what it means to be educated, to measure what is most meaningful, and to systematically document and improve learning. More research, development, and dissemination of effective assessment practices are needed.

Student Expectations: Based upon the conversation and research presented about student expectations, there appears to be a considerable gap between what students will expect (certifications and practical job skills) and the directions of most higher education reform efforts (e.g., civic engagement, global understanding, integrated learning). It is incumbent upon us to reconcile these differences while recognizing the validity and integrity of both.

Finally, participants were asked to identify what actions can be taken from here as a result of the conversation. They recommended the following:

- Communicate these lessons in meaningful ways to policymakers and leaders.
- Use the internet to communicate, share, and collaborate. Exploit our resources.
- Spread the word: hold these conversations at the local, state, regional, and national levels and in conjunction with K-12 and university partners.
- Take local and individual action to support reform efforts at home.
- Write to congress people and ask for support of the NSF budget, particularly for implementation projects for what we know works. Bridge the implementation gap. Congress may be more supportive than NSF administration and national administration.
- Send a copy of this report to the American Association of Community Colleges for dissemination.
- Create a listserv for attendees to continue the dialogue electronically.

APPENDIX A: PLANNING TEAM MEMBERS

Peter Brown	Biology Faculty
Nicole Cerveny	Geography Faculty
Madeleine Chowdhury	Math Faculty and Faculty Developer
Mangala Joshua	Physics Faculty
Shereen Lerner	Anthropology Faculty
Jonelle Moore	English Faculty
David Nachman	Chemistry Faculty
Ly Tran-Nguyen	Psychology Faculty
Naomi Story	Faculty Director, Center for Teaching and Learning
Carol Achs	Dean of Math, Science and Physical Education
Andrea Greene	Dean of Institutional Research and Planning
Principal Investigator	
Gail Mee	Vice President for Academic Affairs
Co-Principal Investigator	
Liz Dorland	Chemistry Faculty

APPENDIX B: PARTICIPANT DIRECTORY

National Community College Conversation
What Does it Mean to be Educated in the 21st Century?
Mesa Community College – Mesa, Arizona
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Sponsored by the National Science Foundation

Name	Title	Organization	City
Carol Achs	Dean- Math, Science & Physical Education	Mesa Community College	Mesa, AZ
R. Eileen Baccus	President Emeritus	Northwestern Connecticut Community College	Winstead, CT
Bill Bade	Chair, Mathematics & Engineering Sciences Dept	Lincoln Land Community College	Springfield, IL
Lynn Barnett	Vice President for Academic, Student & Community Development	American Association of Community Colleges	Washington, DC
Sadie Bragg	Senior Vice President for Academic Affairs	City University of New York Borough of Manhattan Community College	New York, NY
Peter Brown	Faculty	Mesa Community College	Mesa, AZ
Lee Burch	Vice President	3DI Corp	Houston, TX
Richard Calabro	Associate Dean for Math & Science	Albuquerque Technical Vocational Institute	Albuquerque, NM
Terry Callaway	President	Central Arizona College	Coolidge, AZ
V. Celeste Carter	Faculty/Director of Biotechnology Program	Foothill College	Los Altos Hills, CA
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Liz Dorland	Faculty	Mesa Community College	Mesa, AZ
Dale Dulberger	Project Manager-21st Century Urban Technical Education Project	Milwaukee Area Technical College	Milwaukee, WI
Paul Elsner	Chancellor Emeritus	Maricopa Community College District	Tempe, AZ
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Dan Ferandez	Faculty	Ann Arundel Community College	Arnold, MD
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Larry Fujinaka	Faculty	U. of Hawaii Leeward Community College	Pearl City, HI
Amadou Gaye	Faculty	Mesa Community College	Mesa, AZ
Melvin D. George	President Emeritus	University of Missouri	Columbia, MO
Donetta Goodall	Associate Vice President of Academic Programs	Austin Community College	Austin, TX
Andrea Greene	Dean- Research and Planning	Mesa Community College	Mesa, AZ
Roberto Gutierrez	Vice President for Instruction	Clark College	Vancouver, WA
Rosemary Haggett	Director, Division of Undergraduate Education	National Science Foundation	Arlington, VA
Rodney Holmes	Dean- Arts, Humanities & Social Science	Mesa Community College	Mesa, AZ
Debra Humphreys	Vice President for Communications	American Association of Colleges & Universities	Washington, DC

Name	Title	Organization	City
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Mangala Joshua	Faculty	Mesa Community College	Mesa, AZ
Ian Jukes	Director	InfoSavvy Group	Kelowna, BC
Stan Kikkert	Faculty	Mesa Community College	Mesa, AZ
Brad Kincaid	Faculty	Mesa Community College	Mesa, AZ
Kaatje Kraft	Faculty	Mesa Community College	Mesa, AZ
Lora Lassitter	Coordinator of Special Events and PR	Mesa Community College	Mesa, AZ
Shereen Lerner	Faculty	Mesa Community College	Mesa, AZ
Jose Leyba	Provost of Downtown Campus	Maricopa Community College District	Tempe, AZ
Gloria Ann Lopez	Dean, Division of Arts & Sciences	Del Mar College	Corpus Christi, TX
Clara M. Lovett	President	American Association for Higher Education	Washington, DC
Joy McMillan	Director, Center for New & Emerging Technologies	Madison Area Technical College	Madison, WI
Gail Mee	Vice President for Academic Affairs	Mesa Community College	Mesa, AZ
Cindy Miles	Vice President of Instruction	Community College of Denver	Denver, CO
Susan Miller	Faculty	Mesa Community College	Mesa, AZ
Mark Milliron	Vice President of the Education Practice	SAS Institute Inc.	Cary, NC
Saundra Minckley	Faculty	Mesa Community College	Mesa, AZ
Steven Mittelstet	President	Richland College	Dallas, TX
Jonelle Moore	Faculty	Mesa Community College	Mesa, AZ
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David Nachman	Faculty	Mesa Community College	Mesa, AZ
Iraj Nejad	Faculty	Mt. San Antonio College	Walnut, CA
Juan Olivarez	President	Grand Rapids Community College	Grand Rapids, MI
Joseph Pearson	Dean, Extended Campus	Mesa Community College	Mesa, AZ
Debra Rowe	Dean of Applied & Engineering Technologies	Oakland Community College	Auburn Hills, MI
Pinny Sheoran	Faculty	Mesa Community College	Mesa, AZ
John Tagg	Faculty	Palomar College	San Marcos, CA
Mike Taylor	President	Stanly Community College	Albemarle, NC
Larry Thacker	Dean- Career & Technical Programs	Mesa Community College	Mesa, AZ
Ly Tran-Nguyen	Faculty	Mesa Community College	Mesa, AZ
Peggie Weeks	N Y State Professional Development Collaborative	Hofstra University	Tyrone, NY
Linda Wegener	Consultant	Wegener & Associates	Tempe, AZ
Louanne Whitton	Faculty	Chemeketa Community College	Salem, OR
Jo Wilson	Dean- Red Mountain Campus	Mesa Community College	Mesa, AZ
Dennis Wilson	Faculty	Mesa Community College	Mesa, AZ
Maureen Zimmerman	Acting Director-Maricopa Center for Learning and Instruction	Maricopa Community College District	Tempe, AZ

APPENDIX C: READINGS

Learning, Research and Reform

How People Learn: Brain, Mind, Experience, and School: Expanded Edition
The National Academies Press
<http://www.nap.edu/catalog/9853.html>

How Students Learn: Mathematics in the Classroom
The National Academies Press http://www.nap.edu/catalog.php?record_id=11101
<http://www.nap.edu/openbook/0309089492/html/R1.html>

Project Kaleidoscope Volume IV: What works, what matters, what lasts - Some Lessons Learned
Jeanne L. Narum, Director, Project Kaleidoscope
http://www.pkal.org/template2.cfm?c_id=1290

National STEM Digital Library
www.nsd.org

How Students Learn: Science in the Classroom
The National Academies Press
<http://www.nap.edu/catalog/11102.html>

How Students Learn: History, Mathematics, and Science in the Classroom
The National Academies Press
<http://www.nap.edu/catalog/10126.html>

Improving Student Learning: A Strategic Plan for Education Research and Its Utilization
The National Academies Press
<http://books.nap.edu/catalog/6488.html>

Suggested Readings

A Bridge for All: Higher Education Design Principles to Broaden Participation in Science, Technology, Engineering and Mathematics
The BEST Initiative (Building Engineering and Science Talent)
<http://www.bestworkforce.org/PDFdocs>

NSF Infobrief: The Role of Community Colleges in the Education of Recent Science and Engineering Graduates
<http://www.nsf.gov/sbe/srs/infbrief/nsf04315/start.htm>

Executive Summary: Shaping the Future New Expectations for Undergraduate Education in Science, Mathematics, Engineering, and Technology

National Science Foundation

<http://web.archive.org/web/20021225125944/>

<http://web.archive.org/web/19990429141845/>

Planning for Neomillennial Learning Styles

Educause Quarterly, Number 1, (2005)

<http://www.educause.edu/apps/eq/eqm05/eqm0511.asp>

New Expeditions: Kellogg Foundation Initiative Charting the Second Century of Community

Colleges <http://www.stanleyfoundation.org/reports/CC3.pdf>

Engaged and Engaging Science: A Component of a Good Liberal Education Peer Review (Winter 2005), AAC&U,

Judith A. Ramaley, president-elect, Winona State University; and

Rosemary R. Haggett, director, Division of Undergraduate Education, National Science Foundation,

<http://www.aacu-edu.org/peerreview/>

Educating the Net Generation (An Educause eBook)

Diana G. Oblinger and James L. Oblinger, Editors

<http://www.educause.edu/content.asp>

Beyond TTWWADI: Reconsidering Education in the Communications, Biotechnology and Nanotechnology Ages

By Ian Jukes & Ted McCain, © The InfoSavvy Group, 2005

<http://www.thecommittedsardine.net/>

From Gutenberg to Gates and Beyond By Ian Jukes

<http://www.thecommittedsardine.net/infosavvy/education/handouts/fgtg.pdf>

Reports & Background

New Expeditions Issues Papers (AACC)

<http://www.aacc.nche.edu/Content/>

National Academies Press: Report of a Workshop The Knowledge Economy and Postsecondary Education

<http://books.nap.edu/catalog/10239.html>

National Academies Press: Transforming Undergraduate Education in Science, Mathematics, Engineering, and Technology <http://www.nap.edu/catalog/6453.html>

The American Community College Turns 100: A Look at its Students, Programs, and Prospects

<http://www.ets.org/research/pic/cc.pdf>

The Boyer Commission: Educating Undergraduates in the Research University
Reinventing Undergraduate Education
<http://naples.cc.sunysb.edu/Pres/boyer.nsf/>

SCANS Report from the Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS)
What Work Requires of Schools
<http://wdr.doleta.gov/SCANS/whatwork/>

Help Wanted...
Credentials Required Community Colleges in the Knowledge Economy
<http://www.ets.org/research/dload/AACCHelp.pdf>

Resources

National Science Foundation

1. Division of Undergraduate Education Publications:
<http://www.nsf.gov/publications/index.jsp?org=DUE>

2. Statistics:
<http://www.nsf.gov/statistics/>

3. National STEM Digital Library
www.nsdlib.org

4. National Science Foundation Support for Two-Year Colleges,
Fiscal Years 1997-1999
<http://www.nsf.gov/pubs/2001/nsf0144/nsf0144.pdf>

5. Shaping the Future: New Expectations for Undergraduate Education in Science, Mathematics, Engineering, and Technology
National Science Foundation
<http://web.archive.org/web/20021219132043/http://www.ehr.nsf.gov/>

6. Shaping the Future, Volume II: Perspectives on Undergraduate Education in Science, Mathematics, Engineering and Technology
<http://www.nsf.gov/pubs/1998/nsf98128/nsf98128.pdf>
<http://web.archive.org/web/19991013162027/www.pkal.org/events/shaping/intro.html>

AACC-American Association of Community Colleges
Research Briefs: http://www.aacc.nche.edu/Template.cfm?Section=Research_Briefs

League for Innovation in the Community College

Learning Abstracts: http://www.league.org/publication/abstracts/learnab_main.htm

AAC&U -American Association of Colleges and Universities

Greater Expectations Report: <http://www.greaterexpectations.org/>

PKAL-Project Kaleidoscope

Reports and Publications: http://www.pkal.org/template2.cfm?c_id=78

AAAS-American Association for the Advancement of Science

1. Table of Contents: Science for All Americans

<http://www.project2061.org/tools/rsipd/Sfaa/index2.htm>

2. College Courses related to Science for All Americans:

http://www.project2061.org/tools/rsipd/Syllabi/col_toc.htm

University Leaders for a Sustainable Future

<http://www.ulsf.org/>

APPENDIX D: PROGRAM

Thursday May 19

7:45 a.m. – Depart from hotel lobby

8:15 a.m.

Registration and Breakfast
Southwest Reading Room,
Paul A. Elsner Library

8:45 a.m.

Opening Remarks and Introductions
Gail Mee, Vice President for Academic Affairs
Mesa Community College

Welcome

Larry Christiansen, President
Mesa Community College

Welcome from NSF

Rosemary Haggett,
Director, Division of Undergraduate Education
National Science Foundation

9:30 a.m.

Learning to Focus on What Matters: Higher Education and the Challenges of a Global Society
Clara Lovett, President, AAHE

10:15 a.m.

Break-out Session 1, LB-145

11:30 a.m.

Report out

12:30 p.m.

Lunch – Southwest Reading Room

1:30 p.m.

Greater Expectations: A Nation Goes to College
Debra Humphreys, AAC&U

2:15 p.m.

Break-out Session 2, LB-145

3:30 p.m.
Report out

4:30 p.m.
Depart to the hotel

5:30 p.m.
Reception, dinner and cultural presentation
Buttes Hotel

Friday May 20

7:45 a.m.
Depart from hotel lobby

8:15 a.m.
Breakfast, Southwest Reading Room

8:30 a.m.
Beyond Shaping the Future: Directions for Higher Learning and the New Workforce
Mel George, President Emeritus,
University of Missouri and St. Olaf College

9:00 a.m.
Break-out Session 3, LB-145

10:15 a.m.
Report out

11:00 a.m.
Conclusions and Recommendations

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APPENDIX E: SPEAKER BIOS

Clara M. Lovett

President of the American Association for Higher Education since August 2003, Clara Lovett is a well-known advocate for education reform. She has been a member of AAHE since 1981 and over the years participated in many Association projects, most notably the Forum on Faculty Roles and Rewards. She was on the history faculty at Baruch College of the City University of New York, chief of the European Division of the Library of Congress, dean of arts and sciences at The George Washington University, and provost of George Mason University. Before becoming president of AAHE, Dr. Lovett was president of Northern Arizona University, where she launched NAU's first capital campaign, raising more than \$100 million in private gifts to create nationally prominent centers for research and teaching in biology, ecology, and the environmental sciences, as well as Native American studies. Dr. Lovett has advised elected officials in Virginia, Arizona, and Utah on education policy issues and has served on the boards of directors of numerous nonprofit organizations and corporations.

Debra Humphreys

Debra Humphreys received her BA from Williams College and her PhD in English from Rutgers University. She is currently the Vice President for Communications and Public Affairs at the Association of American Colleges and Universities. Prior to her current position, she served as Director of Programs in the Office of Diversity, Equity and Global Initiatives at AAC&U. She also served as Executive Editor of AAC&U's quarterly publication, *On Campus with Women*, and Founding Editor of the quarterly, *Diversity Digest*. She currently oversees public affairs programs and outreach, media relations and the development of all of AAC&U's publications, marketing efforts, and Web resources. Dr. Humphreys worked on the coordination of AAC&U's national initiative, *Greater Expectations: The Commitment to Quality as a Nation Goes to College*, and helped to edit and publicize its publication, *Greater Expectations: A New Vision for Learning as a Nation Goes to College*. Currently she is directing AAC&U's advocacy efforts in the new initiative, *Liberal Education and America's Promise: Excellence for Everyone as a Nation Goes to College*—conceived as a decade-long effort to increase public understanding of and commitment to liberal education for all students.

Melvin George

Melvin D. George is President Emeritus of the University of Missouri, President Emeritus of St. Olaf College, and Professor Emeritus of Mathematics, University of Missouri-Columbia. After receiving a Ph.D. in Mathematics from Princeton University, George joined the faculty of the University of Missouri in 1960. He became Associate Dean of the Graduate School in 1967, then moved to the University of Nebraska-Lincoln in 1970 as Dean of the College of Arts and Sciences. He returned to the University of Missouri as system-wide Vice President for Academic Affairs in 1975, serving as Interim President in 1984 before moving to St. Olaf College in Minnesota as President in 1985. Following his retirement from St. Olaf nine years later, George served for nearly two years as Vice President for Institutional Relations at the University of Minnesota. He returned to Missouri in 1996 and served a second time as Interim President of the University of Missouri system in 1996-97. During the period 1994-96, he chaired the National Science Foundation's review of undergraduate science, mathematics, engineering, and technology education, culminating in the report "Shaping the Future: New Expectations in Undergraduate Education in SMET." George currently serves on both the Advisory Board of the NRC's Center for Education and Division for Behavioral and Social Sciences and Education.