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ABSTRACT

The Dwight D. Eisenhower Program for Mathematics and Science Education of the U.S. Department of Education provided a forum in which state and federal representatives could develop strategies to support the implementation of recently developed mathematics and science education standards. This conference report describes the presentations and discussions that took place during the conference sessions. Reports addressed the following topics: (1) the need for standards to ensure quality and equality in education; (2) the science standards for curriculum, teaching, and assessment; (3) the educational goals of the Federal Coordinating Council for Science, Engineering, and Technology; (4) assessment models from mathematics; (5) collaborative work for systemic change with the Education Commission of the States; (6) Eisenhower initiative including the Eisenhower National Clearinghouse, the Eisenhower Consortia, Eisenhower state programs, IKElinks, and coordinator training; (7) methods of implementing systemic change; (8) future federal legislation; and (9) a brief history of the Eisenhower program. Separate inserts include a list of conference participants' names and addresses and a list of names and phone numbers for Eisenhower State Grant program coordinators. (MDH)

EISENHOWER LINKS

The Dwight D. Eisenhower Program for Mathematics and Science Education

Association of State Supervisors of Mathematics
Council of State Science Supervisors
The Education Commission of the States
Mathematics Sciences Education Board
National Governors' Association

CONFERENCE REPORT

December 6-9, 1992

Standing from left to right: Jo Baker, Joseph S. D'Agostino, Carolyn Joyner. Seated from left to right: Christine Jackson, Doris Crudup, Clare Gifford

Standing from left to right: Conrad Katzenmeyer, Kathy Fuller, Eve M. Bither, Carole Lacampagne, Annora Dorsey. Seated from left to right: Mary Lewis Sivertsen, Rebecca Wilt, Luna Levinson

Standing from left to right: Judy Coleman, Ruth M. McDowell, Vera Redfearn Faulkner, Winfred Redfearn, Gary G. Allen, Todd Beaver, Beth M. Coleman. Seated from left to right: Renee Brace, Holly Kathryn Larson, Deborah C. Fort, Deborah L. Coleman

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The Triangle Coalition has prepared this conference report for the U.S. Department of Education.

April, 1993

Dear Colleague:

We are at a critical time in education reform. Thanks to efforts of the National Council of Teachers of Mathematics and National Research Council we agree on standards in mathematics and science, and we are beginning to understand how education systems need to change to support these standards. We know that the whole system, from the efforts federal agencies promote and support to the classroom interaction between teacher and student, must be aligned to help students reach new standards.

This conference created the opportunity for state teams to collaborate and develop strategies for change. It was also an opportunity to link representatives of federal programs, such as the National Science Foundation's Statewide Systemic Initiative, and the U.S. Department of Education's Eisenhower Programs and Consortia, with other people in their state who are also promoting systemic change in mathematics and science. By bringing these different state groups together, we have begun the conversation on how all reform initiatives can be connected to improve student learning.

But much remains to be done. How can we involve all the key players in each state in the kinds of discussions begun at the conference? How can states begin to make some of the connections between mathematics and science initiatives that federal agencies are making? How can we begin to link reform efforts within states, and how can states support them?

The mood at this conference differed from many we have attended. The way participants focused on their team discussions was impressive. By setting a new conference norm of creating action back in each state, participants seemed to view the meeting through a different lens. They became less passive and more interested in conference speakers and activities because what they were learning was relevant to their work. Questions that were asked. "What do you mean by this?" "Who do you think can help us with that?" reflected a healthy pragmatism and a search for concrete strategies to take home.

How can we keep an open dialogue between state and federal leaders so that federal initiatives really support systemic change in states? When will higher education be brought into the conversation? How will teacher education change to support the standards? We hope states will address these questions in their reform agendas. Unless we can simultaneously change a majority of the elements that make up education systems, we will not be able to substantially improve the education our children are receiving.

We should celebrate our success at the conference and the difficult and complex changes we are beginning to make in education systems. We look forward to future conferences where we can build support to promote systemic change.

Sincerely,

Frank Newman

Frank J. Newman
President
Education Commission of the States

Mary Jean LeTendre

Mary Jean LeTendre
Acting Assistant Secretary
for Elementary and Secondary Education
U.S. Department of Education

Using Standards to Fight Standardization

Addressing conferees twice, retiring **Office of Educational Research and Improvement** assistant secretary **Diane Ravitch** emphasized the need for standards, a need as bipartisan as she believes it is essential.

Born out of the education goals that evolved at the national governors' conference (1989), which was called by then-President George Bush (Republican) and chaired by then-Governor and now-President Bill Clinton (Democrat), the call for standards is likely to be heard as clearly by the new administration as by its predecessor. This bipartisan support means that the work on standards-based reform should continue, become stronger, and receive more funding.

"If we don't know what outcomes we seek," Ravitch asked, "how can we move toward them?" Standards provide not only a goal but also an engine of reform, she said. Now, "we have standardization without standards: Standardized texts and standardized tests but no standards to drive them.

"Standards are the starting point and the concluding point in the educational race," she said, admitting that the terms of the fourth goal, namely that American students will be "first in the world in science and mathematics achievement" may change in favor of a focus on excellence rather than competitiveness. "What's important," she said, "is that we *have* six ambitious goals toward which we are moving" at a rate that is being regularly monitored by the bipartisan National Education Goals Panel. Emphasis on the goals, she thinks, will remain constant.

Quality and Equality?

Having standards, Ravitch said, will improve both the quality and the equality of education itself. She reported on a recent meeting on education standards with representatives of 15 Asian-Pacific societies. Pointing out that the United States was almost alone in having no explicit educational standards, she said that the other nations explained their reliance on standards for two reasons. They improve achievement and they lead to equality of educational opportunity.

Diane Ravitch

Ravitch argued that this position provided a way to link excellence and equity. "Equality is impossible when some schools, even with equal financial resources, have low expectations and incoherent curricula.

"Children must have equal opportunity to learn—which standards promise—in order to have equality of opportunity," she asserted. She noted, however, that the act of setting standards (outcomes) in no way prescribed the means by which they are achieved.

Working Standards

Ravitch had high praise for the 1989–1991 National Council of Teachers of Mathematics' (NCTM) *Standards* for curriculum and teaching. Not only were the creators successful in writing an excellent and useful pair of documents but also, thanks in part to the 1980s math teachers' meetings to "rescue their discipline," the *Standards* have had an impact far beyond other curricular and instructional experiments. Unlike the "failure" of the new math in the 1960s (then, Ravitch said, you couldn't buy a text that wasn't new math; now, you can't buy one that is), and the "deleterious" (to children's learning) back to basics movement, the *Standards* are now in use in more than 40 states. They have had an impact on assessment, teacher preparation, parent involvement, and textbooks.

The Department of Education supports this precedent, said Ravitch, and calls for standards in other fields. She noted the Department's award to the National Academy of Sciences for science standards (see pages 18–19) and cited similar grants for civics, geography, history, the arts, English, and foreign languages. Following the NCTM *Standards* model, she advised reformers to

Access

"We expect all children to be involved in hands-on math and science education," she said, "not just those who are college bound." This goal will also change teacher education.

"We have to educate everyone," she said. But the status quo, which has long ignored the most unfortunate, benefits a lot of people. Change will not be easy: "Many think that the ability to learn is innate rather than the result of effort.

"We must achieve excellence and equity together, not separately," she said, a stance leading to increased representation of women and minorities in math and science.

"We want *all* children to learn," she concluded. "It's not enough just to say that all children *can* learn; we need to say all children *will* learn."

start with standards, and then move to other parts of the educational structure: Inservice training, for example, and parent roles.

Student command of new standards must be measured with new tests. Accordingly, in cooperation with the Mathematical Sciences Education Board, the NCTM is developing assessment standards for math.

Ravitch cited an Education Testing Service study now underway that points out an anomaly: Many states want children to know materials they don't expect teachers to know. More federal money is needed for staff development, she said, because of the huge changes being contemplated.

There is serious interest in new and different methods of assessment across the board from a number of groups nationwide. Ravitch especially mentioned the work, at "unprecedented speed," of the National Council for Educational Standards and Testing. This group recommended a national assessment *system* for individual students—not a single national *test*—but suggested that states and consortia of states need to create new kinds of tests, ones based, for example, on performance not multiple choice.

As formidable a force for reform as standards could be, Ravitch noted their appropriate limits. For example, she said, the Department of Education has a hands-off attitude as to the *how* and the *content* of the standards, which must be developed by scholars, teachers, educators, and independent groups expressing a broad consensus. National standards would *not* aim to create a national curriculum or attempt to tell classroom teachers what to do.

The Department wants to see voluntary state curriculum frameworks that reflect national standards. "The standards projects have not been put into business," warned Ravitch, "to get into pedagogical imperialism. Their task is to define outcomes, not to say how to get to them." National standards should be shaped by states and by consensus within fields, she said, "not received like stone tablets from Mount Sinai." They should be broadly inclusive, involving as many as possible, especially teachers.

If they don't work in educational practice, however, they will not survive. "We must rely on the incredible ingenuity and wisdom and craft of teachers to put those standards into classroom practice."

The curriculum frameworks competition is open to all states, she added. If effective, the state frameworks could become strategic action plans for changing teacher education and certification, staff development, assessment and textbooks. This is what systemic reform means: Using standards to realign all the other parts of the educational system around the goals of student learning. The states have the power to control the marketplace by using their curriculum frameworks to change teacher certification, assessments, and textbooks. In turn, because of the magnitude of the changes required for systemic reform, the federal government should provide money to support staff development and design of new assessments.

Standards for Science*

Speaking on the work of the **National Education Standards Project**, a National Research Council project commissioned in 1991, were the chairs of its three working groups, **Karen Worth** (teaching), **Audrey B. Champagne** (assessment), and **Henry W. Heikkinen** (curriculum). The goal of the Project is to develop science education standards for grades K–12 and to build consensus among a range of constituencies nationwide to put those standards in place. The National Research Council was asked by the National Science Teachers Association, the Department of Education, the National Science Foundation, the National Education Goals Panel, and several scientific societies to develop standards for science education along the lines of those successfully proposed and disseminated by the National Council of Teachers of Mathematics for curriculum (1989) and teaching (1991). The science standards for curriculum, teaching, and assessment, however, will be expressed in a single document.

Teaching

Worth identified three separate yet interlocking dimensions of science teaching that will be defined by the standards:

- the knowledge and skills necessary to provide students with experiences that will lead to valuable outcomes in school science
- a set of goals for teachers' development along a continuum from preservice to continuing inservice professional development
- the necessary resources and support to provide opportunities for valuable science teaching

Worth noted that the standards will include examples of exemplary teaching practices to illustrate a variety of ways in which teachers can create supportive classroom environments that facilitate exploration, connect science to students' experiences and to other disciplines, and encourage an understanding of "the culture of science."

Assessment

Audrey B. Champagne

According to Champagne, assessment standards will define

- the methods for assessing and analyzing students' accomplishments and the opportunities that programs afford students to achieve valued outcomes of school science
- the ways of obtaining appropriate correspondence between assessment data and the purposes that data will serve
- the characteristics of valid and reliable science assessment data and appropriate collection methods

Karen Worth

Assessment data will inform both teaching and learning, helping teachers make day-to-day decisions about what to teach and how to teach it, as well as to communicate the learner's progress to students and to parents. The standards will also define criteria to aid administrators in making judgments about the quality of teachers and science programs. A third major function of assessment standards is in the policy arena: They will provide criteria for the data collection that will inform policy makers as they decide how to allocate resources, set guidelines for the graduation or licensing of teachers, or attempt to attract business to a specific area.

Henry W. Heikkinen

Champagne noted that there has been "considerable

*For updates on work on the Standards and to offer feedback, contact the National Research Council, 2101 Constitution Avenue, NW, HA486, Washington, DC 20418. Telephone: (202) 334-3628

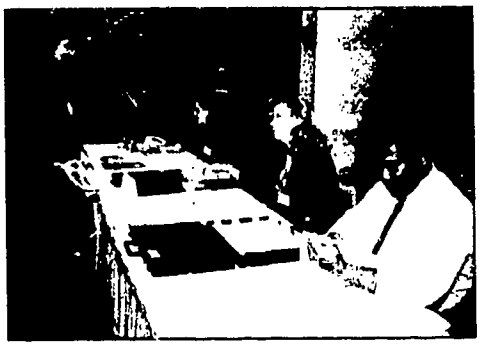
dissatisfaction" with contemporary assessment processes, specifically citing the discontinuity between the science education curriculum and the way in which it is often assessed. For instance, while exemplary science instruction emphasizes the development of scientific reasoning, assessment instruments often evaluate only the learner's store of factual information. Thus, one of the major challenges in the standards development process will be to define methods for achieving appropriate correspondence between assessment data and the purposes that they will serve.

Ruth M. McDowell, registration staff member

Curriculum

Heikkinen expressed his hope that the development of curriculum standards will "broaden the definition of school science content" so that it encompasses a much richer range of student learning. He emphasized that school science content is more than subject matter. It also includes the ability to carry out scientific investigations and to understand modes of reasoning involved in scientific inquiry. In addition, science applications are important in areas of student learning, as are the social and historical contexts in which science has evolved. These all contribute to a comprehensive view of the scientific endeavor. Heikkinen pointed out, and provide a basis for understanding "how we know what we know."

Through extensive review and critique of the draft standards offered by all shareholders nationally, Heikkinen's group hopes to arrive at a consensus that will affirm the importance of depth of student science understanding rather than superficial exposure to a myriad of unrelated factual details. Such a stance, he noted is congruent with positions already taken by the National Science Teachers Association's *Scope, Sequence, and Coordination* and the American Association for the Advancement of Science's *Project 2061*.



Staff register conferee. From left to right: Beth M. Coleman, Deborah L. Coleman, Winfred L. Redfearn

What is Science?*

The work in curriculum addresses the following range of concepts of science. They encompass

- a body of knowledge
- a way to generate and test new knowledge
- a human and cultural activity
- a subject with personal applications and uses
- a subject with applied industrial, economic, and technological uses
- a subject with environmental and social implications

*Modified from Richard Kempa (1983) Developing new perspectives in chemical education in Maunce Chastrette, Danielle Cross, Andre Rambaud, and Henry W. Heikkinen (Eds.) *Proceedings of the Seventh International Conference on Chemical Education* (Montpellier, France, Universite des Sciences et Techniques du Languedoc).

In The FCCSET* Spirit

Joining Department of Education staff on a panel to brief participants about programs and resources available for precollege mathematics and science within the federal government were **Deborah V. Gallaway** of the **National Aeronautics and Space Administration**, **Cindy Musick** of the **Department of Energy**, and **Joseph V. Stewart** of the **National Science Foundation**. Speaking for **Education** were **Carole B. Lacampagne** and **Mary Lewis Sivertsen** (Office of Educational Research and Improvement) and **Luna Levinson** of the National Diffusion Network.

FCCSET at Work

Lacampagne provided a brief history of the work done by and planned for the important FCCSET Committee on Education and Human Resources, on which she serves. The 18 federal agencies, which have worked together for over three years, base their efforts on several central assumptions, among them

- Science and technology are critical.
- American precollege science and mathematics education has fallen behind that of many other countries.
- Federal leadership and commitment in this area is right and necessary.
- The National Education Goals and the science and mathematics standards provide useful frameworks for change.
- America must educate *all* students in science and mathematics.

She outlined the Committee's plans for the next five years: They aim at three groups of outcomes, all targeted for fulfillment by 1998.

Part of Tier I focuses on precollege mathematics and science, asking that in these areas there be

- development or revision of state curriculum frameworks with teacher certification reflecting these changes
- creation of comprehensive curriculum models
- conducting of regular assessments
- intensive training of roughly 600,000 teachers through federal programs

Tier I, which is also concerned with undergraduate education, entails comprehensive evaluation of federal programs in mathematics and science.

Tier II has three prongs: It will work at increasing the numbers of underrepresented groups in mathematics and science fields; it will disseminate quality resources; and it will investigate the best ways of implementing educational technology.

The third tier seeks to increase the proportion of scientifically literate adults from an estimated 5 percent today to 50 percent by century's end. It also plans to foster more collaboration across the educational spectrum—linking high schools, two-, and four-year institutions.

National Science Foundation Initiatives

Stewart of the Foundation's Teacher Preparation and Enhancement Division brought word of the discouraging state of much of American science students that make FCCSET activities vital. In seventh grade, Stewart said, half of U.S. students express an interest in science or engineering, but the numbers drop precipitously, those for females even faster than for males, as formal education continues. By college graduation only 9 percent of the men and 4 percent of the women want to be scientists or engineers.

"We aren't doing as well as other countries," Stewart said. "And no way is it good news that about half of the Ph.D.s in science and engineering go to foreign born students."*

*FCCSET (pronounced fix it), which stands for the Federal Coordinating Council for Science, Engineering, and Technology, is now much better known by its acronym than by its full title. For the latest document on FCCSET activities, *Pathways to Excellence: A Federal Strategy for Science, Engineering, and Technology Education* (1993), write to FCCSET, CEHR, c/o National Aeronautics and Space Administration, Office of Human Resources and Education, 300 E Street, SW, Washington, DC 20050.

Cindy Musick and Mary Lewis Sivertsen

By tenth grade, according to a Foundation study, most students see scientists as destructive nerds.

Stewart's division attempts to change this picture and exodus through endorsement of the FCCSET objectives and through specific program initiatives for teacher enhancement. They include institutes and conferences to help mathematics and science educators and teachers become aware of new trends, content, and approaches. In cooperation with the Eisenhower Program, the Foundation is now working directly with teachers, schools, and districts.

To achieve a systemic approach, Stewart said, Foundation money goes mostly to programs supported by commitments from the whole school affected. In addition, he stressed the importance, in line with Foundation objectives, of dissemination, evaluation, verification of practices.

For further information, call Stewart at (202) 357-7539.

Science Education at Energy

Musick noted that the interest of Energy in precollege education is a relatively recent phenomenon. The Department, which originated in World War II with the Manhattan Project that built the atomic bomb, has long focused primarily on weapons, basic science, environmental restoration, and, of course, energy itself.

"Education," said Musick, "is now a major mission." To that end, the Department is developing a strategic plan to define and intensify its role in math and science education reform. While Energy hasn't chosen to develop much curriculum, she said, "it instead focuses on real life experiences and creates portable modules." Energy programs for elementary and secondary education support four FCCSET priorities.

The top emphasis, she said, is on teacher enhancement programs. Energy's teacher research program sends 150 teachers into 25 labs, where their first-hand experiences help them to teach seventh and eighth grade mathematics and science. Energy also supports preservice teacher enhancement, she noted, by spending $400,000 dollars encouraging undergraduate math and science students to go into teaching.

In collaboration with a number of other federal agencies (including the Departments of Commerce and of the Interior and the Smithsonian Institution), business, and universities, Energy contributes to month-long, lab-based summer institutes for middle and high school math and science teachers.

- In addition, Energy provides a variety of student incentives including
- six- to eight-week workshops for sixth to tenth grade girls and minorities
- the National Science Bowl, in which 12,000 students participated last year
- supercomputer experiences

Finally, scientists from the national laboratories go into schools, and Energy participates in many science literacy programs.

For further information, call Musick at (202) 586-8949.

Space in School: NASA

The National Aeronautics and Space Administration (NASA), said Gallaway, has seen itself as directly involved in education at all levels since its inception. Its inspiring mission and its unique facilities make it an ideal and committed member of the FCCSET group striving to forge a "strategy for change" in science education. About 20 percent of NASA's budget for education is targeted toward precollege programs, she said. (The

*National Science Board (1991), *Science and engineering indicators—1991* (Washington, DC: Government Printing Office), p. 59.

rest is about evenly divided between undergraduate and graduate support.)

By interesting children in aeronautics, space science, and technology, NASA seeks to build an enthusiastic and talented workforce for tomorrow. Among the programs serving nearly a million and a half elementary and high school students and teachers, Gallaway mentioned the Aerospace Education Services Programs, workshops for elementary and secondary school teachers, the Space Science Student Involvement Programs, the Lunar Sample Program, and Community Involvement Programs. NASA is also involved in many science and engineering fairs.

"There is a minority focus in all our programs," Gallaway noted.

In addition, NASA works to serve teachers, reaching more than 129,000 in 1991. It leads workshops, runs the Teacher in Space Program, provides electronic connections via Spacelink and videoconferences, and offers many teaching materials through its Central Operation of Resources for Educators (Ohio) and its local and regional teacher resource centers.

For information on how to access these materials nationally or locally, call (216) 774-1051, extension 293 or 294. For further information on NASA precollege programs, contact Gallaway at (202) 358-1516.

Selected Education Programs

Two Office of Educational Research and Improvement staff members, Sivertsen and Levinson, briefly mentioned a number of programs besides Eisenhower whose activities are particularly relevant to FCCSET goals. Sivertsen listed the following programs (see box).

Former Eisenhower staff member Levinson told conferees that she advocates "break-the-mold grantsmanship" between the National Diffusion Network and Eisenhower projects, none of which currently receive Network funding. The Network now supports 19 mathematics and science projects.

Developer grants, she said, are worth approximately $70,000 and average four years; some are refunded. The Network validates successful projects for six years; however, most grants call for dissemination nationally for two to four years. Current plans look to increased collaboration with the National Science Foundation.

Carole B. Lacampagne

For further information, contact Levinson at (202) 219-2138.

Education Programs

- Five university-based *Educational Research and Development Centers* (contacts are Lacampagne (mathematics — (202) 219-2061) and Sivertsen (science — (202) 219-1966))
- Two *Field-Initiated Studies* (contact is Deborah Monroe (202) 219-2223).
- The *Fund for Innovation in Education* (contact is Shirley Steele (202) 219-1496; for Comprehensive School Health Education Programs, contact Shirley Jackson (202) 219-1556)
- The *Javits Gifted and Talented Students Education Program* (contact is Patricia O'Connell Ross (202) 219-2187)
- The *Star Schools Program* (contacts are Cheryl Garnette or Joe Wilks (202) 219-2116)
- The *Blue Ribbon Schools Program* (contact is Steve O'Brien (202) 219-2141)
- Ten *Regional Educational Laboratories* (contact is Charles Stalford 219-2126; see page 20)
- The *Educational Partnerships* (contacts are Sue Gruskin or Deborah Williams (202) 219-2132)

Assessment Paradigms from Mathematics

Nancy S. Cole

It is time, according to **Nancy S. Cole** of the **Educational Testing Service**, that educators reclaim assessment as an active tool in the business of teaching and learning rather than continuing its all too frequent status as a passive measurement of student outcomes. "The driving purposes for testing," she said, "have been for external monitoring and accountability," adding that she sees "increasing skepticism that tests can be neutral instruments."

In the movement toward more meaningful and productive school assessments, the mathematics community, basing itself on the much praised National Council of Teachers of Mathematics *Standards* for curriculum (1989) and teaching (1991), leads other fields. Currently underway is a joint effort by the Council and the Mathematical Sciences Education Board to reform assessment; although it obviously focuses on math, it sets a path for "other reform efforts that include but reach beyond mathematics . . . to raise similar requirements for assessment in relation to educational improvement." A number of useful directions, findings, and examples appear in the *Measuring Up: Prototypes for Mathematics Assessment* (1993).*

"I expect the math and science communities to lead the way in assessment," she said.

A Grade Eight Task*

You and a friend read in the newspaper that "7 percent of all Americans eat at McDonald's each day." Your friend says that "that's impossible." You know that there are approximately 250,000,000 Americans and 9,000 McDonald's restaurants in the United States.

Convince your friend in writing that the statistic is possible.

*Vermont Portfolio Assessment Program.

Two Touchstones

Both expressed in and supporting the *Standards*, two "tenets," with accompanying criteria, also underlie the direction of current assessment reform. They are, she said,

- All students must develop different and higher levels of mathematical power: Assessments must involve tasks that require *demonstration* of these new types of mathematics learning.
- Mathematics education aims to improve learning for all students: All educational actions in mathematics, *including assessment*, must promote its improved learning and teaching.

Tests embracing these two tenets would meet "positive improvement goals" and could be used to promote learning and the development of talent in all students, she said.

And Three New Roles for Testing

Cole believes that promotion of these principles means that reformed assessment will exemplify agreed-upon standards; serve as learning experiences; and provide experience-based results.

Mirroring Standards

The standards are generally reflective of the six education goals adopted by the president and the governors (1989), more narrowly defined in curriculum frameworks and course outlines, and specifically expressed by field in the math *Standards* (in process in science [see pages 6–7]). The standards, she pointed out, are expressed

*National Research Council, Mathematical Sciences Education Board (Washington, DC: National Academy Press. To order, call (800) 624-6242

verbally: they are thus accessible to students, teachers, the community (including, of course, parents). When students put them into action, then, their work makes sense within a recognizable framework.

After providing conferees with a number of examples of such successful assessment activities (see boxes), Cole noted that, to exemplify standards, assessments must

- represent the standards faithfully
- show parts of the standards not in common use
- be memorable, stand out as important and new
- communicate high standards but not be out of reach

Tests as Instruction

The best assessment, Cole said, teaches as it measures. Again offering effective examples (see boxes), she summarized the characteristics of assessments providing learning activities as follows. They

- involve students in important mathematical work
- engage interest and attention
- require students to construct knowledge for themselves
- include assistance for teachers on use
- provide help for students and teachers in evaluating and improving

Linking Performance-Based Results

Cole noted problems and failures historically with attempts to anchor test results to instruction. New efforts with common scoring rubrics for performances of students which teachers are trained to apply offer a very different way to try to give performance-based meaning to scores that are relevant to instruction.

Offering as an example a set of materials from the *New Standards Project* in which children are asked to choose fish (within a budget) for an aquarium of a specified size, she again summarized how assessments can provide "performance-based meaning." They

- require student performances of a size and complexity to define a unit or piece of student work
- use scoring rubrics to describe levels of achievement
- train teachers to use the rubrics effectively

Putting a student's effort into the context of the *Standards*, she said, makes the unit of his or her work cease to be a short multiple-choice math question and become "a complex mathematics problem requiring mathematical power." Further, teacher involvement in creating and using rubrics gives participants an essential shared experience and vocabulary.

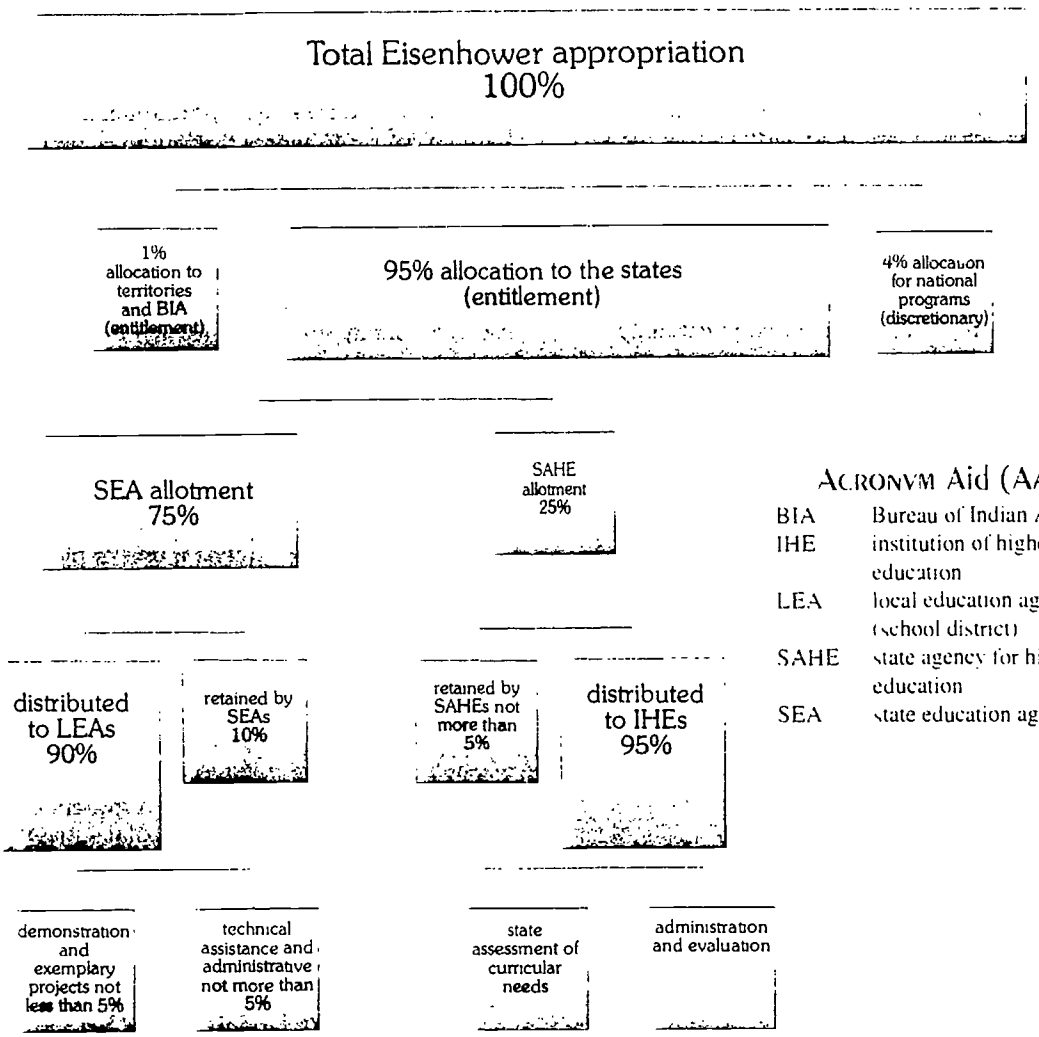
The new assessments, Cole admitted, are harder to develop than traditional tests. They often require substantial collection of materials. They take more time to administer. But, she concluded, "they don't just measure results; *they teach*."

Pacesetter Mathematics: The Situation

[illegible] in the attached [illegible] [illegible] Pacesetter Mathematics [illegible] [illegible] Pennsylvania lottery in 1992. The amount at stake was $1 million to be paid in 20 annual installments of $50,000 each. As was reported in the newspaper, Harry retired immediately, spent $50,000 each year, received its last check in 1991, and was broke in the summer of 1992.

Students are then given tables on [illegible] [illegible] [illegible] [illegible] [illegible] void Harry's fate.

Eisenhower Mathematics and Science Education Program Funding



Acronym Aid (AA)

BIA	Bureau of Indian Affairs
IHE	institution of higher education
LEA	local education agency (school district)
SAHE	state agency for higher education
SEA	state education agency

Connecting With IkeFunds: Advice for Teachers

If your school system doesn't have Eisenhower funds or if you have questions about their distribution, ask the

- local math or science supervisor
- school district math or science supervisor
- state math or science supervisor
- Eisenhower coordinator (in your state department of education)

If specific questions remain, contact the
U.S. Department of Education
Eisenhower Program for Mathematics and Science Education
Room 2040
400 Maryland Avenue, SW
Washington, DC 20202-6140
(202) 401-1336

—Joseph S. D'Agostino, Raymond E. Simpson
Former staff members, The Eisenhower State Program

Connecting With the Education Commission of the States

In line with the goal of the Eisenhower Program to work collaboratively with other private, local, state, and federal groups and organizations committed to system-wide education reform, the 1992 national meeting was held jointly with the Education Commission of the States (ECS). The joint meeting, which fell between introductory and concluding sessions devoted directly to Eisenhower concerns, brought the ECS and its constituency together with Eisenhower federal staff, state coordinators, math and science supervisors, consortia and clearinghouse staff, and national grantees.

What is the ECS?

The ECS, which has been working with state leaders to improve the quality of education for more than 25 years, is an ideal partner with Eisenhower to work for system-wide reform. Its work is a nonfederal (though it includes federal entities) expression of the FCCSET spirit* writ nationwide.

The only major education organization that does not serve a particular special-interest group, ECS reaches thousands of policymakers and educators in every state. Its constituents include people involved in all levels of the education system—from kindergarten through higher education—and in all role groups—teachers, parents, business people, legislators, state and local board members, and the like. This unique perspective allows ECS to analyze an issue from many sides and bring together people with diverse perspectives to work with and learn from one another.

A combination of direct person-to-person contact, program and project work, group meetings, and public visibility keeps ECS abreast of education issues, so it can provide continuing assistance to constituents and help policy makers change education systems to better serve the needs of all children.

James Bryant Conant, president emeritus of Harvard University, proposed the concept of an "interstate planning commission for education" in *Shaping Educational Policy* (1964). Conant's studies convinced him that the country needed a way for states to become deeply involved in shaping education policy. Under the guidance of former North Carolina Governor Terry Sanford, Conant's vision became reality as the ECS in 1966. A unanimous vote that year at the National Governors' Conference called for a nationwide alliance for the improvement of education with the active leadership and personal participation of the governors.

As a nonprofit organization, ECS obtains financial support through a mixture of state fees, state contracts, and foundation and federal grants. Current funding is approximately $6 million a year.

The leadership of the ECS alternates annually between a Republican and a Democratic governor. Current chair is Governor Evan Bayh (D-Indiana), who

Who Belongs to the ECS?

Forty-nine states (all but Montana), the District of Columbia, Puerto Rico, American Samoa, and the Virgin Islands are members, which appoint, usually through the governor's office, seven ECS commissioners who represent all segments of education. These 371 commissioners, who serve for one- to three-year terms as liaisons to other education leaders in their state and nationwide, include

- all the governors
- more than 130 state legislators (usually heads of House and Senate education committees)
- state and local school board members
- chief state school officers
- state higher education executive officers
- college presidents
- superintendents
- teachers
- dozens of other prominent education leaders

Over 4,000 policy makers and education leaders are ECS alumni.

*See pages 7–9

succeeds John McKernan (R-Maine) and who will be followed by Jim Edgar (R-Illinois). Frank J. Newman serves as president (see pages 2 and 18–19).

To reach its goals, identify critical education issues, and carry out its mission of promoting quality education for all students, ECS conducts policy research, surveys, and special studies; convenes state, regional and national forums; maintains an information clearinghouse; keeps education issues in front of the public through communications efforts; provides technical assistance to states; helps states develop policies to improve education; publishes and distributes education policy materials; and fosters nationwide leadership and collaboration in education.

ECS Initiatives

Several ECS' initiatives are in direct line with Eisenhower goals, including efforts to improve mathematics and science education as well as to reform teacher education. Major ECS initiatives include work on

- *mathematics and science improvement*—collaborative work with national leaders in mathematics and science education reform to promote the improvement of teaching and learning in these fields
- *Re:Learning*—a partnership among ECS, the Coalition of Essential Schools in Providence, Rhode Island, and participating states, districts and schools, to restructure the education system fundamentally from the schoolhouse to the statehouse
- *school finance*—tracking school finance systems in all 50 states and doing research on how education dollars flow from the state level to the school site, the implications of current budgeting and funding processes, and the impact of restructuring schools on the allocation of resources
- *business education partnerships*—collaborative work with the Council for Aid to Education in four states to support efforts to improve the education system by encouraging the development of partnerships among the business community and education and political leaders
- *teacher education*—involvement in a national effort to improve the preparation of teachers and link teacher preparation more closely with efforts to restructure the public schools

Forging ECS Links to Eisenhower Links

Five Networks

ECS sponsors five formal networks of education and political leaders:

- Its *advisory commissioners*, the executive directors of 25 public and private national education associations, advise ECS on the priorities of their constituents, who represent every major education audience.
- The *State Education Policy Seminars*, a network jointly sponsored by the Institute for Educational Leadership, convene state policymakers to explore and debate education issues.
- The *Legislative Education Committee Chairs* network, sponsored in conjunction with the National Conference of State Legislatures, organizes national and regional seminars of legislative leaders to stimulate their thinking on education.
- The *Governors' Education Policy Advisers* network, which links ECS and the National Governors' Association to the governor's office in each state, meets at least twice a year to study education issues and interact with peers in other states.
- The *Legislative Education Staff Network*, cosponsored by National Conference of State Legislatures, enables legislative staff to share information and talk with experts about education issues.

ECS National and Regional Meetings

Of particular interest to Eisenhower participants, particularly after the success of this joint meeting, are a number of ECS-sponsored regular education gatherings. Eisenhower representatives are welcome to attend all ECS meetings, including*

- *The National Forum and Annual Meeting* (to be held July 14–16, 1993, in Pittsburgh) attract hundreds of education,

*To receive mailings on special meetings, call (303) 299-3621

political, and business leaders, including ECS commissioners and alumni, to discuss major issues affecting K–12 and postsecondary education.

• *Special national meetings*, such as a mathematics and science education reform symposium with the National Science Foundation and the *ECS–Business-Education Policy Forum*, bring many of education's players together.

• *Special regional meetings*, such as a recent conference on restructuring with the Colorado Association of School Boards, provide opportunities for discussion.

ECS Priorities—Dovetailing With Those of Eisenhower

The sustained, multi-year action agenda to which ECS is committed fits nicely with Eisenhower goals. ECS favors

• **fundamentally changing the education system** to better educate all students for life in the 21st century

• **transforming teaching and learning** by emphasizing higher expectations for all students and defining and promoting innovation and excellence in teaching

• **embracing diversity**, making children the priority and tackling the issues of poverty and discrimination in society

Other Linkages

State Relations

Through its State Relations program, ECS monitors political and legislative activity across the country; maintains working relationships among ECS, its member states, and other organizations; and supports ECS Clearinghouse and network activities.

Communicating and Disseminating

To help create a national and state climate where education reform can flourish, ECS works closely with major national media, pointing out significant issues, providing appropriate frameworks for stories, offering examples of successful school and district programs, and identifying people to interview. ECS staff and constituents also contribute articles to various publications, participate on editorial boards, and work with organizations on public service campaigns. Over the past five years, ECS has greatly expanded its communications efforts to include the general public as well as the media and traditional constituents.

Clearinghouse

While the role of the fledgling Eisenhower National Clearinghouse is just being defined, the ECS maintains an Information Clearinghouse as its centralized resource and research arm and the central source of information about education issues and trends. The Clearinghouse responds to approximately 3,000 inquiries a year from legislators, governors' aides, political advisers, reporters, national education organizations, business people, state and federal agencies, school boards and other groups, providing them with topical research and publications for sound decision making and reporting. A resource library and computerized database are maintained on all 50 states with information on more than 300 topics.

Publications

A major publisher and distributor of education policy materials (both print and video), ECS' distribution center handles more than 100 titles.

For further information contact the
Education Commission of the States
707 17th Street, Suite 2700
Denver, CO 80202-3427
(303) 299-3600

Project-Based Change Versus Systemic Change*

Project-Based Change	Systemic Change
A Shift in Power and Roles	
The locus of control ultimately resides with the external funders and external project experts.	The locus of control ultimately resides with those living and working within the system.
The primary change agents are external to the system being changed.	The primary change agents are key players in the system that is changing itself.
External change agents are principal investigators, designers, leaders, orchestrators, developers, and/or experts.	External change agents are facilitators, organizers, coordinators, and/or technical assistants.
External project members' activities are seen as the central project activity; activities of local participants are a means to the project's goals.	Local activities are the central, ongoing project activity; the activities of external project members are a means for enabling and supporting local change processes.
Schools are field or test sites; they are used to "pilot" new ideas.	School sites are the primary actors and beneficiaries.
A Shift in Focus and Perspective	
Short-term efforts focus on one or two dimensions.	Long-term efforts focus on many dimensions simultaneously.
Temporary efforts develop alternatives and operate parallel to mainstream practices.	Continuing efforts focus on changing mainstream practices.
With a selective focus, projects deliberately ignore some dimensions and constraints.	With a comprehensive focus, systemic efforts address all relevant dimensions and constraints.
Objectives center around project goals (direct impacts, leverage, and catalytic effects).	Objectives establish community capacity to identify problems, access resources, and engage in self-sustaining development.
Projects operate within constraints of existing economics, structure, and governance.	Systemic efforts address key constraints—economic, regulatory, structural, and cultural.
Projects use schools, teachers, and students to learn better how the project (model) should work.	Systemic efforts use researchers and experts to learn how the system might modify its efforts to change.

*The chart on pages 16–17 is a condensed version of one compiled by Mark St. John (1992, revised 1993), which was originally published in *Science education for the 1990s: Strategies for change* (Inverness, CA: Inverness Research Associates). For full text, including sections on differing models of change, call (415) 669-7156.

Leverage

Funders seek local efforts with influence over broader audiences.	Funders seek local efforts that can motivate permanent change of the local system.
Projects seek to be catalysts or build replicable models.	Systemic efforts seek to build long-term capacity and foster self-sufficiency.

Criteria for Success: Evaluation

Funders value novelty, innovation, and effectiveness.	Funders value collaboration, incremental value, capacity building, and integration.
Funders support projects based on the expertise of external change agents.	Funders support efforts based on the capacity and commitment of the system.
Projects aim at specific changes: evaluation studies project "impact."	Projects aim at development: evaluation studies the community's capacity to build.
Projects' success is judged by standards that focus on quality and extent of impacts and outcomes.	The efforts' success is judged by standards that focus on quality of process interactions.
Evaluations by outside objective evaluators yield proof of effectiveness, generalizable findings, prescriptions, and recommendations for others.	Evaluation by participating insiders or outsiders contributes to the conversation; specific findings are rarely generalizable; recommendations are aimed at system participants.

Leadership

Traditional leaders in the discipline and/or education head projects.	Leaders come from local educational communities as well as disciplines and/or education.
Leadership skills and expertise are traditionally concentrated and centralized; projects belong to the leaders.	Leaders maintain vision but are inclusive. Leadership is decentralized and the project belongs to the community.
Leaders oversee all activities.	Leaders oversee the vision.
Leaders are chosen because of their external credibility and stature.	Leaders are chosen because of their internal credibility and stature.

Shooting a Train to the Moon

From left to right: Diane Ravitch, Alicia Coro, Kenneth M. Hoffman, Luther S. Williams

Kicking off the joint Eisenhower and Education Commission of the States' meeting was a panel of federal officials deeply involved in the reform of math and science education. **Alicia Coro**, director of School Improvement Programs, and **Diane Ravitch** (see pages 3–4) represented the **Department of Education; Luther S. Williams**, the **National Science Foundation's** assistant director for education and human resources and a leader of the **Federal Coordinating Council for Science, Engineering, and Technology (FCCSET)**, spoke for both the Foundation and FCCSET's Committee on Education and Human Resources. Representing the **National Research Council of the National Academy of Sciences and Engineering**, an official but private advisory body to the federal government that has among its charges the development of the science standards (see pages 5-6), was **Kenneth M. Hoffman**. Moderating the discussion was President **Frank J. Newman**, of the **Education Commission of the States.**

Panelists agreed not only that cooperation in math and science education reform is essential, but also that many federal, state, and local entities, which in past years often dissipated energy in turf battles, appeared willing to collaborate. To be effective, reform must go system-wide: It must involve as many of the component parts of America's educational structure as possible, panelists said. The very existence of the joint conference, Coro said, speaks to a willingness to work together to make a reality.

The spirit of cooperation starts at the top, Ravitch noted, citing both the bipartisan nature of education goals and the standards they are engendering. "Systemic reform should start with standards," she said, which will be shared by people in the states.

She spoke of her admiration for the achievements of the FCCSET committee in uncovering and coordinating the work for science and math education within 18 federal agencies to forge a complementary—rather than duplicating and or competitive—system. As an example of this spirit, she cited the "stunning accomplishment" of the National Science Foundation and Department of Education cooperative *Statement of Principles*.

What is Systemic Change?

Newman asked participants for their definition of *systemic* change, as opposed to other kinds. Williams, whose directorate at the National Science Foundation is responsible for the Statewide Systemic Initiatives, defined it as a "comprehensive and fundamental" shift within an existing status quo. Systemic change, he said, occurs not within satellites but is basic, affecting an entire school, district, or state. Further, Williams said, this kind of change acts on all components, practices, policies, and outcomes.

Paraphrasing Ravitch, Newman suggested that it is important to start with the outcomes, finding out how to arrive at them after their definition. Picking up the engineering metaphor, Hoffman noted what he saw as an analogy between systemic educational reform and going the to moon: "The standards," he said, "are the guidelines that help us navigate. Also," he said, "we're all going in the same general direction. I'm not talking about one-time change."

Newman noted that it is perhaps easier to think of smoothly running systems in organizations like National Aeronautics and Space Administration than in people-oriented institutions like American education.

Williams agreed that while the importance of standards and cooperation cannot be overemphasized, the need to engage the current system and its machinations ("a monstrous apparatus already in place") means that the space analogy has limited validity.

Said Hoffman, to be effective, "change has to be systemic. If one component is left out, inertia will drag everything down."

Here's the task, said Ravitch: Take a train (a 19th-century vehicle) and shoot it to the moon. That, said Newman, is also the problem: "We are going to the moon on a train."

A participant suggested a new metaphor: "Reforming math and science education is like changing someone who has a drug problem. The abuser has to admit the problem before change is possible."

"Oh, oh," quipped Newman. "Now we're on a train heading toward the moon driven by a drugged-out engineer."

Frank J. Newman

Systemic and Incremental Change

The panelists distinguished between incremental change in response to crisis to which the education community is accustomed and the systemic approach necessary not only to reform math and science education but also to solve other far-reaching social problems of the late 20th century.

Williams noted the necessity of committing resources and individuals to spend time thinking on how to achieve systemic rather than merely incremental reform. Ravitch, however, saw "no conflict between incremental and systemic change. Don't be intimidated that you have to be systemic," she advised. "Share the vision, start with standards, know what the goal is, work on your piece, and you're being systemic."

Remembering the Audience

Newman summarized the discussion:

- Start with a clear idea.
- Put it in the framework of the new system (and the old).
- Let systemic change move incrementally.
- Carry public opinion with you.

Ravitch noted the roadblock to reform that many people pose when they attribute the ability to learn to innate factors rather than to effort. Such people, said Newman somewhat facetiously, decide that "their kids can't learn math because they don't have the math gene which all Korean and Japanese kids have."

Coro pointed out that while reform must be comprehensive, it must directly affect individual schools and districts, for which she serves as an advocate. "Remember," she cautioned, "that kids are our primary clients. They are in the districts."

"We know what happens in classrooms," Newman said, "and to some extent how it works." The problem is getting effective practices in place across the board. The federal level offers some coherence, he said. We need to mirror its example in the schools and states. Suggested Williams, "to move *toward* the synthesis necessary is to move *beyond* categorical areas."

Newman summed up with his hope that the procedures defined in the reform of math and science education could serve as vehicles for many other educational reforms.

Eve M. Bither

New director of the **Programs for the Improvement of Practice Eve M. Bither** spoke frequently to conferees about the goals that inform the projects with which she is most concerned. She believes that the success of the Eisenhower Program will be measured in terms of its ability to enhance mathematics and science education, an ability that will improve when the "enormous energy" going into those curriculums becomes synergistic rather than fragmented, as it sometimes is at the moment.

"Real change," she said, "happens only at the personal and local level."

Like others at the conference, Bither is committed to the development of standards, not only in science and mathematics (see pages 3–6) but also in other subjects such as English, history, the arts, and assessment.

Charles Stalford

The national program needs to continue its support for system-wide change through a focus on elimination of state and local barriers between delivery of the best in mathematics and science materials to the schools, she said. Those materials, collected from many sources as well as those federal resources in the Eisenhower Clearinghouse, will be made available through the 10 recently organized consortia set in the "accumulated experience" of the well-established national laboratories.

Bither looks to the extension of partnerships among precollege educators, postsecondary institutions, and business and industry. She sees as models the work of the Federal Coordinating Council for Science, Engineering, and Technology, as well as the interaction among the Education Commission of the States, the National Governors' Associations, and the Department of Education taking place at the conference.

The Frameworks

Becky Wilt, Eisenhower project officer for the six state curriculum frameworks, elaborated on their role in the Eisenhower National Program. The three-year projects enjoy first-year funding of $1.7 million. Individual grants range from roughly $158,000-$380,000. The frameworks attend to mathematics, science, or both, from K-12; two jurisdictions, Wilt said, chose also to include technology. Proposals must define what, when, and how to incorporate "world-class standards" into teaching those subjects, she emphasized. Competitions are now being held to choose 9 to 10 more states for awards in 1993.

Speaking to conferees on particular frameworks were Patricia Dyer (New York—[518] 474-9713) and Kenneth R. DiPietro (Rhode Island—[401] 277-2821).*

The Program Director Speaks

Charles Stalford,† who now leads the **National Program,** summarizes his views:

> It is a privilege to be associated with the Eisenhower National Program, whose objective is to provide the best information based upon research and development, as well as experience, to help improve mathematics and science education. Due to the progress resulting from efforts by the National Council of Teachers of Mathematics, the National Science Teachers Association, and other groups, as well as Eisenhower, our work can help to inform efforts to bring about general systemic reform.

*For further information from the national office, contact Wilt at (202) 219-1775. The other state contacts are Barbara T. Jackson (District of Columbia [202] 724-4235), Martha M. Green (Florida [904] 488-1702), Joseph Rosenstein (New Jersey [908] 932-4065), Ann Masters (Nebraska [402] 471-4816).

†For further information, contact Stalford at (202) 219-2126.

Recent discretionary grant opportunities from the National Program have, therefore, been oriented in this direction. As a basis for many other initiatives, Eisenhower national funds support the National Science Standards Project underway in the National Academy of Sciences.* In addition, the Program funded six states to develop curriculum frameworks in math and science education, and more awards will be made this year. Funded states work with school districts and other educational entities to address the frameworks and related issues such as certification and teacher education.

Synergy between the Eisenhower state projects delivering services and national projects (including the Clearinghouse and the consortia) providing knowledge and assistance to improve those services is potentially strong.

This synergy and its requisite collaboration will not occur automatically. To make this potential a reality, state projects will need a new emphasis on knowledge while national projects will need an increased stress on service. All of us will need to continue our commitment to the goal of helping students better learn math and science.

I look forward to working with all Eisenhower parties toward that goal.

Call Your Director!

[illegible] directors repeatedly invited conferees to keep in close touch as [illegible] networks define their tasks and refine their goals. Contact persons [illegible]

Region and Consortium Name	Director
Appalachia *Consortium for Transforming Mathematics and Science Instruction*	Pam Buckley (304) 347-0400
Mid-Atlantic *Mid-Atlantic Regional Mathematics and Science Consortium*	Keith Kershner (215) 574-9300
Mid-Continent *[illegible] Plains Consortium for [illegible] and Science*	John Sutton (303) [illegible] 7-0990, ext. 3018
North Central *Midwest Consortium for the [illegible] of Mathematics and Science Education*	Gil Valdez [illegible] Thomas (708) 571-4700
Northeast and Islands *The Regional Alliance for Systemic Mathematics and Science Education Reform*	Doug Reynolds (508) 470-0098 Robert McLaughlin (802) 223-0463
Northwest *The Northwest Consortium for Mathematics and Science Teaching*	Rob Larson (503) 275-9594
Pacific *The Pacific Mathematics and Science Regional Consortium*	Rita Inos Winona Chang (808) 532-1900
Southeast *Southeast Regional Mathematics and Science Consortium*	Dorothy Routh Francena Cummings (904) [illegible] 452-6001
Southwest *Southwest Consortium for the Improvement of Mathematics and Science Teaching*	Wes Hoover (512) 476-6861
West *Far West Laboratory Math and Science Regional Consortium 2000*	Art Sussman Steve Schneider (415) 565-3000

The major change in the national discretionary program lies in its emphasis on systemic change. To that end, it funded the Eisenhower National Clearinghouse for Mathematics and Science Education, based at the Ohio State University, and the 10 regional consortia, whose roles were debated, sometimes hotly, in breakout sessions attended by Eisenhower coordinators and representatives of the Education Commission of the States.

*See page 6 for more details

The Eisenhower National Clearinghouse

Addressing the conferees on several occasions was interim director **Len Simutis,** who is leading the five-year $3.5 million contract (awarded annually) to the Ohio State University Research Foundation. The Eisenhower National Clearinghouse for Mathematics and Science Education will collect and store precollege math and science instructional materials and disseminate them to K–12 teachers. It will also gather information on federal programs devoted to precollege math and science and disseminate all these materials to the public and to networks.

Simutis sees the Clearinghouse's mandate as aimed at two overall goals: First, to increase access to and use of excellent and available curricular and instructional materials developed with federal and other funds; second, to support and disseminate national and state efforts at reform. While aiming at the high-tech classroom of the future, Simutis intends that the Clearinghouse be realistic about the technological limitations of America's current educational structure.

"We will not be an inter*knot*," Simutis said, "for those who don't have infrastructure to support electronic communication."

He solicited cooperation from conferees on their perceptions of what the relationships between the Clearinghouse and the consortia should be. Both institutions, he said, plan to coordinate and "interoperate" with existing programs to supplement not replicate regional and state efforts. The Clearinghouse will

- provide a central permanent repository open to the public
- produce a catalog, including abstracts and availability data, of math and science curriculum materials—print and non print—on paper, on-line, and on CD–ROM
- compile a database, including the catalog's materials, often with full texts or images, as well as evaluations
- offer an on-line network through which teachers may communicate and provide materials and evaluations
- collect and disseminate many print materials listing government math and science programs, examining selected topics, describing exemplary programs, and detailing Clearinghouse services and products

Simutis briefly described plans for the next five years.

During the first year, the Clearinghouse will gather materials (particularly on exemplary programs), work on abstracting and cataloging, and develop appropriate software. Print catalogs and Clearinghouse descriptions should be available before the second year, which will see the creation of an on-line computer network to interface with schools and libraries that have the necessary technologies. By year three, Simutis plans that teachers and others will have access to the materials themselves (not just to catalog entries) as well as to evaluative materials.

In many instances, the Clearinghouse work, Simutis said, will depend on its important relationship to the regional consortia (see page 23). The Clearinghouse intends to take advantage of pathways of access already existing, to develop technology jointly, and to coordinate with the National Science Foundation and other federal agencies. Representatives plan to keep in close touch with Eisenhower coordinators and other major players in math and science education.

The Participants Speak

Observation: The Clearinghouse selection criteria should not be secret. Everyone should share and work from consensus.

Response: The Clearinghouse will publish its selection criteria by fall, 1993.

Suggestion: I know you have to *collect* almost everything, but you can be selective in what you *disseminate*: Be sure not to make matters worse by flooding us with bad materials.

*For further information on the Clearinghouse, contact Simutis at Area 200, Research Center, 1314 Kinnear Road, Columbus OH 43212. Telephone (614) 292-7784; E-Mail: lsimutis @magnus.acs.ohio-state.edu.

Eisenhower Consortia

Representatives of the new regional consortia, funded in 1992 at $12 million, met with conferees from their areas in individual breakout sessions. The meetings allowed consortia leaders to explain the organizational beginnings of their plans, to define their aims, and to solicit input and involvement from state teams made up of Eisenhower coordinators, federal personnel, representatives of the National Governors Association and the Education Commission of the States, and other experts in math and science. Their audience wanted to make sure that all relevant voices had been and/or were being heard. Many expressed concern that the consortia not add another unnecessary layer to the federal bureaucracy, that they not duplicate services and materials already being provided, and that all relevant players be contacted. To this end, a number of consortia plan toll-free numbers.

Coordinating the consortia for the **Office of Educational Research and Improvement** is **John C. Egermeier**, who explained their purpose over the next three years as serving school staff by disseminating exemplary math and science education instructional materials, providing technical assistance in teaching methods and assessment, and supporting development of state curriculum frameworks and alternative assessments. The consortia, which will operate under broadly representative oversight boards, will establish electronic communications through toll-free dial ups and Internet to connect with various networks already in place. The consortia will also coordinate with other programs and agencies, such as the Federal Coordinating Council for Science, Engineering, and Technology, the National Science Foundation, the Star Schools, and numerous branches of the Department of Education.

Egermeier and other consortia administrators urged participants to join with the consortia to plan and form policy, conduct activities, take advantage of expertise, make connections, and use resources directly. Among those already available are materials to strengthen professional development, to raise student outcomes, and to provide technical assistance. The consortia also are assisting state efforts to improve standards, frameworks, guides, certification, and the like.

Each consortium's regional boundaries are those of the corresponding regional educational laboratory, which coordinates much consortium activity.

For consortia contacts, see page 21.

The Participants Speak

Question: Are state math coalitions left out of the planning of the consortia? Is this deliberate?
Answer: No, where this has occurred, it is simply an oversight or a step not yet completed. Math and science groups will be involved—and have been.
Observation: You will need to achieve an interface between math and science, while maintaining the integrity of each.
Question: What happens when a teacher calls?
Response: A staff member or volunteer provides immediate assistance. We'll connect people with a lot of resources they can tap.
Warning: Watch out for information overload.
Observation: We will distinguish between project-based change and systemic change, identify the best of both, and promote the latter.

Eisenhower State Concerns

Alicia Coro (pictured with Thomas C. Sawyer)

Veteran Eisenhower State staff went over the goals, the reach, and the documentation—internal and external—of the programs. **Alicia Coro,** director of **School Improvement Programs,** described how State Eisenhower fits into the overall picture of education in America, from its niche within the system-wide approach to reform that stretches across federal agencies and state and local government to its essential constituencies—"the teachers and the kids."

Daniel F. Bonner

The Eisenhower budget, now at $248 million, Coro reminded conferees, has continued to grow since its inception in 1988 (see page 32 for specifics). She and her staff discussed the necessity of dispensing those monies effectively, within the terms of the law.

Doris Crudup

Senior program officer **Doris Crudup** pointed out that the program's viability depends in large part upon the work of the coordinators in gathering data on its activities to verify at least compliance and, better, achievements and to begin to lead toward reasonable assessment of its progress toward its stated goals. She noted the importance of collaboration with the various professional associations as well as a continued meaningful mesh with the national education goals, standards, reforms, curriculum frameworks, and federal agencies.

Like math education program specialist **Clare Gifford,** Crudup stressed the need that Eisenhower's story be told. Eisenhower has been the subject of a number of studies (see box on page 25), not all of them entirely positive. All these documents, Gifford said, make useful reading. She encouraged conferees to gather original data for state headquarters in Washington and their own presentations on the Program.

Rick Davis, science program specialist, noted that assessment and documentation of Eisenhower's achievements (and difficulties) are essential activities. This understanding has led to regular funding for compilation of performance reports and for other data collection methods, including the development of Eisenhower indicators in cooperation with the National Academy of Public Administration. Three-quarters of a million dollars has been earmarked for another in-depth study, along the lines of the *SRI Report* (1991), planned for 1994.

All state staff pointed up the vital need for communication, electronically via *IKElinks* and conventionally, among Eisenhower state and national program personnel and between federal and state administrators and those teachers and students in the schools they serve.

The Director's View

Replacing retiring Lee E. Wickline as head of the state Eisenhower programs is new school effectiveness division director **Daniel F. Bonner**, who summarized his views on Eisenhower:

> Would we have to invent an Eisenhower Program if one didn't exist? The answer, I firmly believe, is yes. The program merits its place in national reform because of

Clare Gifford and Charles D. Watson

- the support it supplies to the National Council of Teachers of Mathematics in seeking to emplace new standards that capitalize on massive research
- the lagging participation in mathematics and science teaching among minorities, an issue the statute addresses
- its pivotal position in fueling reform as coordinative catalyst with the National Science Foundation and other concerned agencies and parties
- its unmatched national presence
- its support for the National Science Teachers Association's endeavor to secure adoption of new curricular standards

Rick Davis

Ike Under the Microscope

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Whatever good things we can find to say about money, it cannot buy an overwhelming drive on the part of all participants in the Eisenhower effort to help ensure success. And success will mean that teachers learn the best—the very best—in classroom math and science methodologies. It is not too much to hope that the upcoming generation of children will vindicate our efforts by having tasted the excitement and adventure of knowing and using mathematics and science.

IKELINKS: ELECTRONIC CONNECTIONS

Todd Beaver (pictured with Cathy Carney)

As part of its three-year Eisenhower technical assistance and leadership development grant, the Triangle Coalition for Science and Technology Education has created *IKElinks*, a national telecommunications network for educators involved in the Eisenhower Program.

IKElinks connects Eisenhower state coordinators; Eisenhower national grantees; Department of Education staff; representatives of other federal agencies; Triangle Coalition members and alliances; science, mathematics, and education organizations; state science supervisors; state mathematics supervisors; and interested leaders of mathematics and science education reform.

IKElinks provides information essential to the Eisenhower Program on topics such as the national conference, steering committee meetings, presentations at gatherings of educators, scientists and mathematicians, publication announcements, national reform initiatives, and legislative updates. Besides providing users with up-to-date information, *IKElinks* makes it possible for them to send private or open messages to anyone else on the network.

In addition, *IKElinks* is "shadowed" by the *Mathematical Sciences Education Leadership Network (MSELnet)*, the electronic network favored by many mathematicians and the *Council of Chief State Science Supervisors Network (CSSSnet)*, the national network of science supervisors. *MSELnet* and *CSSnet* users can access *IKElinks* information and connect with network users.

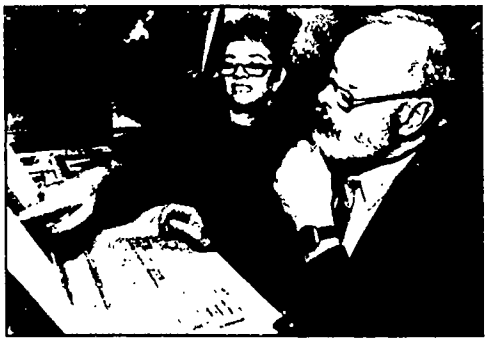
USERS

IKElinks, with 150 users nationwide, is growing. Approximately 80 of them are program leaders in Eisenhower—for example, coordinators of higher education agencies or state education agencies, state math and science supervisors, or federal staff. Thirty-eight states have at least one coordinator on-line; the goal is to enroll all state coordinators on the network.

HOW *IKELINKS* WORKS

IKElinks uses *People Sharing Information Network (PSInet)* software, a computer conferencing tool that costs about $100 and links any number of work stations to a personal computing system (a network) via standard telephone lines and modems.* The purchase of *PSInet* is a valid use of Eisenhower funds, and there are no server fees or initiation costs. A toll-free number further minimizes user costs.

IKElinks is managed by Todd Beaver of the Triangle Coalition, who provides training on the network at Eisenhower meetings nationwide. For further information, contact Beaver (user name *TRIANGLE04)* at (301) 220-0174, or Department of Education network experts Rick Davis (user name *DOED_IKE*, telephone [202] 401-0164) or Clare Gifford (user name *Network*, telephone [202] 401-1137).



Participants Link

*When installing PSInet, enter Triangle as "server name" and 18005820115 as "server phone." Your "user name," which is any 11 alphanumeric characters, should reflect your state, your role in Eisenhower, and your name. For example, Texas state education agency coordinator Jane Doe might be TXSEADOEJAN.

Rookie Workshop: The Basics Explained

First-time Eisenhower state coordinators and some old hands wanting a refresher course spent a morning learning the ropes from members of state program staff, including branch chief **Doris Crudup**, math team leader **Clare Gifford**, science team leader **Rick Davis**, and program officers **Carolyn Joyner** and **Joseph S. D'Agostino.*** Participants were also joined by veteran coordinators **Mary Kay York** (Wisconsin), who was shortly to be elected cochair of the steering committee, **James Woodland** (Nebraska), **Tom C. Farley** (Idaho), and **Peggy Franklin** (North Carolina).

Crudup gave a brief overview of the program, outlining the formula for disbursement. The Eisenhower Program is primarily a state formula grant program, she said, with 95 percent of funds distributed at the state level. (See graph on page 12.)

The Eisenhower Program is a "huge piece of what's happening in math and science education today," said Gifford. Legal administration of monies is essential, as the Program concentrates on making the dollars work best for mathematics and science education. The question has shifted, said Gifford, from, "*Can* the district do this?" to "*How* and *what* can it do?" As leaders in the fields of mathematics and science education, she emphasized, Eisenhower coordinators shoulder a large responsibility. Coordinators must know about standards, curriculum frameworks, new approaches to assessment, the players and organizations with power, and collaborative efforts. In addition, they must review proposals from institutions of higher education and applications from school districts, provide leadership in the state, and raise the Program's visibility in the mathematics and science community.

Davis discussed ways to enhance program communication, coordination, and collaboration. The new electronic network, *IKElinks*, set up by the Triangle Coalition, facilitates communication between the coordinators and program staff. (See page 26 for more details.) "This conference is about trying to figure out who the players are," said Davis, listing a few: State education agencies; state agencies and institutions of higher education; business and industry; professional organizations; and federal entities, including regional consortia. Some of these links are strong, said Davis, while others, like the connection to business and industry, need work. "How to strengthen these ties?" he asked. Several ways, said Davis, among them system-wide models in general and Statewide Systemic Initiatives in particular; the national Eisenhower Conference; other professional gatherings; state and regional planning meetings; advisory boards; and training of trainer models.

The Eisenhower Program has a clear mandate to increase the participation of the underrepresented, said Joyner. These once-ignored populations are now targeted; state education and higher education agencies now have to explain in their applications how they will increase access for students and teachers from underserved and underrepresented populations.

"What works?" asked Joyner and listed common characteristics of programs successful in reaching disadvantaged minorities: For instance, early intervention, family support, and hands-on experiences. She suggested other prescriptions for change, such as school observations to monitor whether mathematics and science classes correctly reflect the schools' racial composition and requiring all students to take algebra by eighth grade and geometry by ninth. Wisconsin has completely computerized its local education agency application process, said York. Now all workshop participants are listed by ethnicity and sex.

Coordinators then broke into two groups to learn more about the concerns of state education agencies serving elementary and high school students (facilitators were York and Woodland) and state agencies for higher education (Farley and Franklin).

*D'Agostino has since left the Program

White Water Rafting With Suzanne Bailey

Suzanne Bailey

Suzanne Bailey, a former K–12 teacher, an adjunct professor at the University of California—Berkeley, a curriculum developer, and a consultant in restructuring, led the entire conference in a day's work of uncovering and dealing with questions. "This is not about answers," she said, "but about compelling questions."

Uninterested in processes that do not promise radical change, Bailey said that she would "pull the plug on any ritual that does not." She strove to develop a "turfless vision.

Riding the Waves

Bailey's metaphor for the day's work was a trip on a raft through swirling rapids. "Enjoy the ride," she invited the participants, as she projected a video of a group careening down a boiling river. Bailey extracted a number of lessons from the raft's capsizing:

- It went over because people brought along too much baggage, she said. But next time they should know to repack.

Participant: It went over because a wave struck it broadside—perpendicular. The excess baggage would have served as ballast, helping the raft stay upright.

- Some people need to tip over to learn they have to give something up.
- Successful rafting demands quick identification of the rocks and the fast spots. In these financial times there are a lot of rocks in the water and a lot of boats are going to turn over.
- A large boulder can be an obstacle or an invaluable force for raising the level of the creek.
- You can ride the wave of the system towards change. You may position yourself in front of the wave, on top of the wave, or you can be the wave.

Participant: Or you can be under the wave.

Participant: Only the top of a wave moves. A meter down the water is virtually still.

"The degree to which this day works is in your hands," she warned. She began by setting the state groups to work at defining the forces boosting and acting as barriers locally affecting science and technology reform. She then asked participants to decide who were the five to seven major stakeholders in their states' systemic reform and to define what was necessary to support links between science and technology.

"Really listen," she advised, "even if just for a day." Bailey applies the techniques she learned from the Navahos to "listen from the heart." This approach, she said, should produce "dialogue and discussion rather than percussion, where people beat each other with ideas until one gives up." She continued

- May you find diversity.
- May you have a lovely argument.

The next group task was to find where either its given state or the case study Bailey provided fit on a matrix showing a continuum of systemic educational change. An overhead on whole system change suggested some of the extra-school entities that should be mapped and assessed, including social services and the legal establishment; the postsecondary community; developers of instructional materials and tests; business, industry, and foundations; professional organizations and consultants; independent schools; special interest groups; the community as a whole; and local, state, and federal government.

Beware of focusing on "the student as output rather than the student as client," Bailey said.

After showing participants a seven-step process to manage change—discovering stakeholders; scanning and forecasting; defining the vision and the mission to serve it; uncovering guiding values and principles; balancing strengths and weaknesses, opportunities and threats; creating strategies in change management; and coping with barriers—Bailey asked participants what they learned (or relearned) and what surprised them.

Participants ride carpet surf

Some Responses

We learned that

- it's good to remember what you thought you do
- the less organization, the better
- what we perceive individually is not identical to what others see
- communication helps—direct (multiple points of contact) better than by mail
- a rural population that is fairly immobile exercises considerable local control
- we can't deal with overall math-science reform because of structural weaknesses
- we can't talk about only one part of the system but must consider all at once
- this is not a linear process: Checklists don't help as we are constantly moving toward an iterative target
- we have to work more strategically with the legislature

And Surprises

We were surprised to find

- how fragmented we are with respect to the continuum
- we are not as far along in systemic change as we are collectively
- boosters and barriers were sometimes the same
- the teachers are involved more than the superintendents
- no coffee at the break

Trying to find new ways of collaborating to achieve systemic change, participants gathered by state at individual tables to experiment to find innovative modes of effective cooperation for change. The day opened with brief presentations from spokespeople for three important groups represented at the conference and working for systemic change: **The Education Commission of the States' Rexford Brown, the Mathematical Sciences Education Board's Robert J. Kansky, and the Department of Education's Rick Davis.**

Distinguishing Systemic Change

Bailey distinguished system-wide change from other kinds—developmental, transitional, transformational, and fundamental. The kind of change necessary to reform math and science education, however, must take into account the whole rather than focusing on a part, must consider the impact of time lag, must appreciate the fact that in a complex system the attempt to affix blame is fruitless, and must view the system in motion.

And Breaking Out of the Loop

Bailey offered conferees a couple of pointers for avoiding fruitless impasses. If you feel stuck, she suggested, "quit doing what you've been doing." And, after each event, "Ask yourself what your action has done to change things.

"I won't come to a meeting," she smiled, "unless my presence can help to change the world."

Changing

Legislating for the Future

Fresh from his election to a fourth term to the **U.S. House of Representatives**, Congressman **Thomas C. Sawyer** (D-Ohio) explained what he sees as Eisenhower's role in a time when stunning change—in education, in politics, in economics, in science and technology, in life-styles—is the rule rather than the exception.

Sawyer, who taught in the Akron public schools and was the town's mayor, serves on the House Education and Labor Committee where he chairs the subcommittee on census and population. Emphasizing the central role of teaching and learning to achieve the flexibility essential to profit from change rather than be overwhelmed by it, Sawyer noted that, while Education's Alicia Coro introduced him as a "former teacher,"

- I am not a former teacher.
- I am a teacher now.
- I am a teacher tomorrow.

"You must all be teachers," Sawyer admonished the enthusiastic audience. He spoke with pride of his work on the National Literacy Act, which—in the FCCSET spirit*—coordinated 79 different federal programs promoting literacy spread across 14 agencies. Eliminating repetition, the Act brings together federal dollars, drives them to the localities where they are needed, and makes a variety of different kinds of programs eligible.

Science Equipment for Teachers and Children

Supporting Eisenhower (as an amendment) and replacing the last session's Elementary Science Facilities Act (which foundered) is the Elementary Science Equipment Act. Sawyer will again team with Senator Mark O. Hatfield (R-Oregon) to sponsor the bill. One change: It has become specific that any state receiving funding show that the equipped teachers are trained by Eisenhower.

Sawyer's version asks for $50 million with no matching state funds (unlike S232, which Hatfield has introduced in the Senate).

"I like Mr. Wizard," quipped Sawyer, "but there are limits to what you can do in a kitchen on television." He hoped the bill would help schoolchildren go beyond their frequent creation of papier mache volcanoes by using the equipment provided to acquire, to discover by learning and measuring real world phenomena. This skill, he joked, "would even be useful for members of Congress."

Preparation for Change

Eisenhower dollars also help America prepare for changes as dramatic as those of a century ago when we as a nation moved from the country to the city, when technology, by decreasing the numbers of people necessary to feed the nation, turned us from an agrarian to an industrial nation. Like then, the changes occurring now are often technologically based, he said. (They are also international and political, of course, with the collapse of the Soviet Union.)

This is a "century of science," Sawyer said. The public schools, which are "the fundamental building block of the American experience," must prepare students for this "time of extraordinary change on a far greater scale than we have ever seen." And, he added, one of the things that distinguishes ours as the finest higher education system in the world—that it is available to all—must also be true of our precollege structure. Much of the attention in the immediate post-Sputnik years dealt with only one end of the spectrum—the talented and gifted students. While they must not be ignored, Sawyer emphasized that it is important to remember that "our job is to educate everyone: We cannot afford to waste a single person."

"When a kid comes to me and asks, 'What should I do with my life?'" Sawyer said, his advice is to become as broadly educated possible. "When you prepare for

*See pages 7–9

your future with a particular discipline in mind," he continued, "it's a mistake to assume it will exist in the future. So learn about as many disciplines as possible, and you will be valuable at intersection."

Eisenhower can help make such preparation a reality.

A New Political Climate

Sawyer noted the reconciliation among the branches of government, with the House, Senate, and White House all controlled by one party, a state that has been "unparalleled for 25 years." He pointed out that the House is a quarter new, with over a hundred freshmen congressmen.

He briefly discussed what he believes to be the specific agenda of the new administration. It will support

- national standards for mathematics and science
- national assessments for schools and students
- better incentives for teachers and alternative certification processes
- national apprenticeships for noncollege bound students
- on-the-job worker retraining to keep place with the rate of change

None of these goals can be approached uncritically, Sawyer warned. For example, "while field-driven content standards have been missing, it is important to watch out that standards don't become an unreachable self-fulfilling prophesy that no one can attain." Local school districts planning professional development and pre- and inservice training should refer to the standards, he said, and translate them into activities teachers can take into classrooms.

As we work to reform assessment, he pointed out, we need to ask "what are we measuring? How can we avoid situations where tests are a means and not an end? How can we make assessments reflect teacher-understood standards?" Sawyer recommends using tests to drive remediation.

Eisenhower addresses many of these issues, Sawyer noted. "It is not ancillary: It is at the heart and soul of reform." Eisenhower is "what we're doing to deliver reform to make the U.S. as important a part of the future as it has been of the past." It calls for

- completion of standards and assessments (practical measures of school systems, program building, students, and curriculums)
- educational flexibility at the local and state level—diversity locally with education serving as an overarching national umbrella
- solid, reliable improvements in the school-to-work transition
- worker retraining to reflect global and national needs and changes
- technology as a learning tool, using computers to learn and to improve teacher student ratio
- real incentives for systemic reform

All of this will cost more money, he admitted, and it will require national commitment. Although Sawyer thinks some revisions in Eisenhower are in order—he would like more money going into long-term training and into preservice, for example—the formula itself, he said, should remain "unchanged" at this point.

He predicted the appropriation of $50 million new dollars—$300 million for the State Program. "We've come a long way," he said, but "we still have a long way to go." Even $300 million will not be enough, he admitted, but it would help to build the program, and "we're probably going to see the appropriation double in the next few years." But we should take that $300 million and make it $600 million by drawing together and bringing in additional dollars, Sawyer suggested.

We need to bring Eisenhower's level of acceptance in the popular understanding to rival that enjoyed by the Chapter I programs, he said. School boards, governors, mayors, city council members now say, "Head Start works," he said. They need to say with similar certainty, "Eisenhower works."

Coming From Capitol Hill

Sandra Cook

Sandra Cook, from the Department of Education's **Office of Legislative and Congressional Affairs**, briefed conferees on recent developments in science, mathematics, and technology education legislation and made several predictions about the directions the new Congress would take. A predilection for "educational reform is building," she said, noting that several significant bills were close to passing before adjournment last November. Cook said that a new version of the Elementary Science Facilities Act (see page 30) is included in the Neighborhood Schools Improvement Act, and she expected to see more action on both bills in the 103rd Congress.

Cook went on to say that she thought that reauthorization of the Eisenhower Program would take place within the context of educational reform by aligning it with the development and implementation of standards and assessments. She noted that "Eisenhower has become more visible" and has received increased funding over the last few years. She speculated on the possible changes reauthorization might bring, saying, "There is concern about the issue of short-term training and the need to better focus what some view as fragmented activities." Other revisions under consideration would grant greater flexibility to the states in use of funds and eliminate or modify the Program's higher education component. She reported some talk of awarding Eisenhower funds competitively rather than on a formula basis but emphasized that the Department has not advocated such a change. She noted that the Administration is still developing a legislative proposal for reauthorization of programs under the Elementary and Secondary Education Act.

Although Cook would be "surprised" if Eisenhower reauthorization passes during the first session of this Congress, the Program, funded through September, 1995, is in no way threatened.

Key Players for the Eisenhower Team

Besides Congressman Sawyer (see pages 30–31), Cook noted the special commitment of several other representatives and senators to the Program. They include Congressman William D. Ford (D-Michigan) and Congressman Dale E. Kildee (D-Michigan), who like Sawyer serve on the House Education and Labor Committee. On the Senate side, Cook counted as friends of Eisenhower Senator Mark O. Hatfield (R-Oregon) as well as members of the Labor and Human Resources Committee Edward M. Kennedy (D-Massachusetts), Claiborne Pell (D-Rhode Island), and Nancy Landon Kassebaum (R-Kansas).

Table 1.
Appropriations since 1984

	Title II		Eisenhower
1985	$97.1 million	1989	$130.5 million
1986	$42.2 million	1990	$132.1 million
1987	$78.4 million	1991	$210.4 million
1988	$117.4 million	1992	$248.0 million

The Eisenhower Program: History and Promise

Joseph S. D'Agostino
Raymond E. Simpson

Federal education legislation in America has long responded to events outside the classroom. As America moves into the 1990s, education seems central to economic, political, and national security and freedom.

But in the 1950s, when the term "cold war" conjured up images of a nuclear holocaust, many Americans based their concept of a strong national defense in education, and the National Defense Education Act (NDEA) was the result. Later, in spite of President Dwight D. Eisenhower's warnings about the military-industrial complex, the nation began to define strength in terms of armaments, and the spirit of the NDEA continued in the Elementary and Secondary Education Act of 1965.

By the 1980s, when the dependence of the nation's economic well-being upon education was recognized, Congress funded Title II of the Education for Economic Security Act as an amendment to the Elementary and Secondary Education Act. Appropriations for the Title II Program varied, but they supported a continuing, though modest improvement program for K–12 mathematics and science education. Following the expiration of Title II, Congress authorized (among the Hawkins-Stafford amendments to the Elementary and Secondary Education Act) the Dwight D. Eisenhower Mathematics and Science Education Program, named to honor the president who signed the first federal legislation specifically designed to assist education in these vital fields.

The Eisenhower Program aims at an attainable but lofty goal: "To strengthen the economic competitiveness of the United States by improving the skills of teachers and the quality of instruction in mathematics and science in the nation's schools through assistance to state educational agencies, local educational agencies, and institutions of higher education."

Funding for Eisenhower has climbed steadily since its beginning. See table on page 32.

After Congress appropriates the funds each year, the Department of Education allocates the monies to the states according to a formula established in the law. That formula is based on two factors:

- population ages 5 to 17
- low income data

States, which must apply for Eisenhower funds, must subgrant about 75 percent of their appropriations through the state education agencies and local education agencies (school districts) in their jurisdiction. In fiscal year 1991, the allocations to the states ranged from $1 million for the least populous state to $20.5 million for the most populous one. The chart on page 12 shows how Eisenhower funds are allocated nationally and distributed within the states.

The Dates

- 1957: The Soviets launch Sputnik.
- 1958: The U.S. Congress enacts and President Eisenhower signs the National Defense Education Act to fund educational programs in several disciplines, especially science and mathematics.
- 1965: After this act expires, Congress continues the program under the provisions of the Elementary and Secondary Education Act.
- 1984: Congress enacts Title II of the Education for Economic Security Act.
- 1988: Congress reauthorizes the spirit of that legislation in the 1988 Augustus F. Hawkins–Robert T. Stafford Amendments to the 1965 Elementary and Secondary Education Act. One of those amendments creates the Dwight D. Eisenhower Program for Mathematics and Science Education.

Joseph S. D'Agostino and Raymond E. Simpson are former staff members with the Eisenhower State Program.

Back cover photograph by April Gower.


Dwight David Eisenhower
USA
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JOINT CONFERENCE OF THE DWIGHT D. EISENHOWER PROGRAM AND THE EDUCATION COMMISSION OF THE STATES

PARTNERSHIPS FOR SYSTEMIC CHANGE IN MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION

Ramada Renaissance Tech World
Washington, D.C.

December 6-9, 1992

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