

SCIENCE EDUCATION REFORM FOR ALL (SERA)

**SUSTAINING THE
SCIENCE, MATHEMATICS
AND TECHNOLOGY EDUCATION REFORM**

Edited by

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AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE

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AMERICAN ASSOCIATION FOR THE
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Founded in 1848, the American Association for the Advancement of Science (AAAS) is the world's largest federation of scientific and engineering societies, with nearly 300 affiliated organizations. In addition, AAAS counts more than 142,000 scientists, engineers, science educators, policy makers, and interested citizens among its individual members, making it the largest general scientific organization in the world.

The Directorate for Education and Human Resources Programs (EHR) seeks to improve education in mathematics, science, and technology; foster equal access to these fields for women, minorities, and people with disabilities; and enhance the public's understanding of all areas of science and technology.

About the American Association for the Advancement of Science (AAAS) Science Education Reform for All (SERA) Project

The objective of the AAAS SERA Project is to provide technical assistance to state departments of education, school districts, and schools to ensure that the benefits of science/mathematics education reform efforts accrue equitably to all students, particularly low-income minority students and inner-city students. Partners in this effort include the Collaboration for Equity: Fairness in Science and Mathematics Education; the Council of Chief State School Officers (CCSSO); the National Science Foundation (NSF) Office of Systemic Reform; the Education Development Center (EDC); and the Technical Assistance Team to the NSF Statewide Systemic Initiative (SSI) sites, Westat*McKenzie Consortium. This technical assistance program has been field tested with three sites: Florida, Michigan, and South Dakota. Specific activities include the following:

- Encouraging chief state school officers and district superintendents to coordinate the planning and implementation of science, mathematics and technology (SMT) education; U.S. Department of Education programs; and other reform efforts.
- Encouraging leaders of professional development programs for teachers to rethink their approaches to these programs, approaches that include SMT content, pedagogy, and assessment training coupled with equity and diversity training.
- Conducting strategy sessions with the leaders and policy makers of systemic reform efforts about science and mathematics education equity issues, including leadership meetings with education policy associations.
- Encouraging state departments of education and school districts to create a cadre of change agents in community-based organizations (CBOs), i.e., knowledgeable individuals who can play a role in education reform and restructuring, particularly as it relates to SMT for children in low-income communities, especially minorities, girls, and those with disabilities.

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CONTENTS

ACKNOWLEDGMENTS	<i>IV</i>
PREFACE Shirley M. Malcom	<i>V</i>
LIST OF ACRONYMS	<i>VI</i>
EXECUTIVE SUMMARY Yolanda S. George	<i>1</i>
SECTION I PROFILES AND LESSONS LEARNED Virginia V. Van Horne	<i>13</i>
Overview	<i>15</i>
Profiles and Lessons Learned	<i>17</i>
Florida	<i>17</i>
Michigan	<i>35</i>
South Dakota	<i>57</i>
SECTION II Views from the Field	<i>77</i>
<i>Using Federal Education Programs to Advance Fairness in Science, Mathematics, and Technology Education.</i> Cynthia G. Brown	<i>79</i>
<i>The Bureau of Indian Affairs School System and School Reform.</i> Sandra Fox	<i>82</i>
<i>A Closer Look at SMT Special Education.</i> Compiled by Yolanda S. George & Virginia V. Van Horne	<i>85</i>
<i>Scoring English Language Learners' Papers more Accurately.</i> Rebecca Kopriva, Julia Lara	<i>105</i>
<i>Highly Successful Schools in Communities Challenged by Poverty.</i> Joseph F. Johnson, Jr., Laura Lein, Mary Ragland	<i>111</i>
Contact Information and Section I References	<i>117</i>



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PREFACE

America's economic strength and position as world leader is directly connected to its scientific and technological achievements. Ideas, skills, knowledge and people flow from universities and colleges that are the envy of the world. The connections between knowledge and leadership will become even stronger as we move into the 21st century, driven by scientific and technological advances.

The people who will lead America in the future are in our schools today. We must be concerned about the quality of their preparation and its adequacy for living and working in a world increasingly defined by science and technology. Schools organized to prepare factory workers or based on the schedules of agricultural work are likely not adequate to prepare knowledge workers, thus the imperative for systemic reform of the kind described in this report.

Systemic reform requires that we refine our goals, clearly articulate standards, describe the quality of work needed to say that standards have been met, and align policies, curriculum, assessment, teacher professional development, teacher preparation and school organization with these standards.

The challenge to create an environment and culture in which reform can take hold is only the first step. Ultimately the effectiveness of reform must be judged on whether all students can be helped to learn and

achieve at very high levels. This requires “top down” and “bottom up” efforts.

The factory model that served as the model for schooling over previous decades depended on systems for sorting and selecting students (managers) who would be given opportunities to learn at the highest levels. The knowledge worker model (depending on autonomy, initiative and the ability to organize data into information needed for decision-making by all workers) demands access to learning at the highest levels by all students.

This report details the journey undertaken by schools, districts and states to reinvent themselves. The greatest challenge is to undertake improvement initiatives that raise the floor for all students while expanding opportunities for all (removing the ceiling) and narrowing (and ultimately eliminating) the achievement gap. Those students least well-served by our current system must be helped to travel the longest journey. Getting from “worst to first” requires thoughtful strategic thinking, a collaboration of partners working from a common plan and resources commensurate with achieving the tasks. We hope that ideas stimulated by this report will assist other educational agencies as they struggle to meet the challenge—to create the talent to lead America through the 21st century.



LIST OF ACRONYMS

AAAS • American Association for the Advancement of Science	NCREL • North Central Regional Education Laboratory
AERA • American Educational Research Association	NCTM • National Council of Teachers of Mathematics
AP • Advanced Placement	NSF • National Science Foundation
BIA • Bureau of Indian Affairs	NSTA • National Science Teachers Association
CBO • Community Based Organization	OIEP • Office of Indian Education Programs
CCSSO • Council of Chief State School Officers	OSES • Office of Special Education Services
CEN • Center for Educational Networking	PA • Public Act
EDC • Educational Development Center	PBL • Problem Solving Level
EEOA • Equal Employment Opportunity Act	PDP • Professional Development Program
EEOP • Equal Educational Opportunity Program	PI • Principal Investigator
EHR • Education and Human Resources	PL • Public Law
ESEA • Elementary Secondary Education Act	PLUS • Parents Lending Us Support
ESOL • English for Speakers of Other Languages	PTA • Parent Teacher Association
FCAT • Florida Comprehensive Assessment Test	R&D • Research and Development
IASA • Improving America’s Schools Act	SCASS • State Collaborative on Assessment and Student Standards
IDEA • Individuals with Disabilities Education Act	SEA • State Education Agency
IEP • Individual Education Plan	SERA • Science Education Reform for All
ISD • Intermediate School District	SLIC • Science Linkages in the Community
LEA • Local Education Agency	SMT • Science, Math, and Technology
LEP • Limited English Proficient	SSI • State Systemic Initiative
MAAAS • Michigan Association of African American Superintendents	TIE • Technology and Innovations in Education
MCTI • Michigan Career & Technical Institute	TIMSS • Third International Mathematics and Science Study
MEAP • Michigan Education Assessment Program	USI • Urban Systemic Initiative
MSSI • Michigan State Systemic Initiative	