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ABSTRACT

The purpose of this brochure is to help educators in schools and school districts understand the fundamentals of what the No Child Left Behind (NCLB) Act means for mathematics and science curricula. Key NCLB requirements for mathematics and science, mathematics and science partnerships, and key resources and products are described. (KHR)

Understanding the No Child Left Behind Act of 2001

Mathematics and Science

quick key 4

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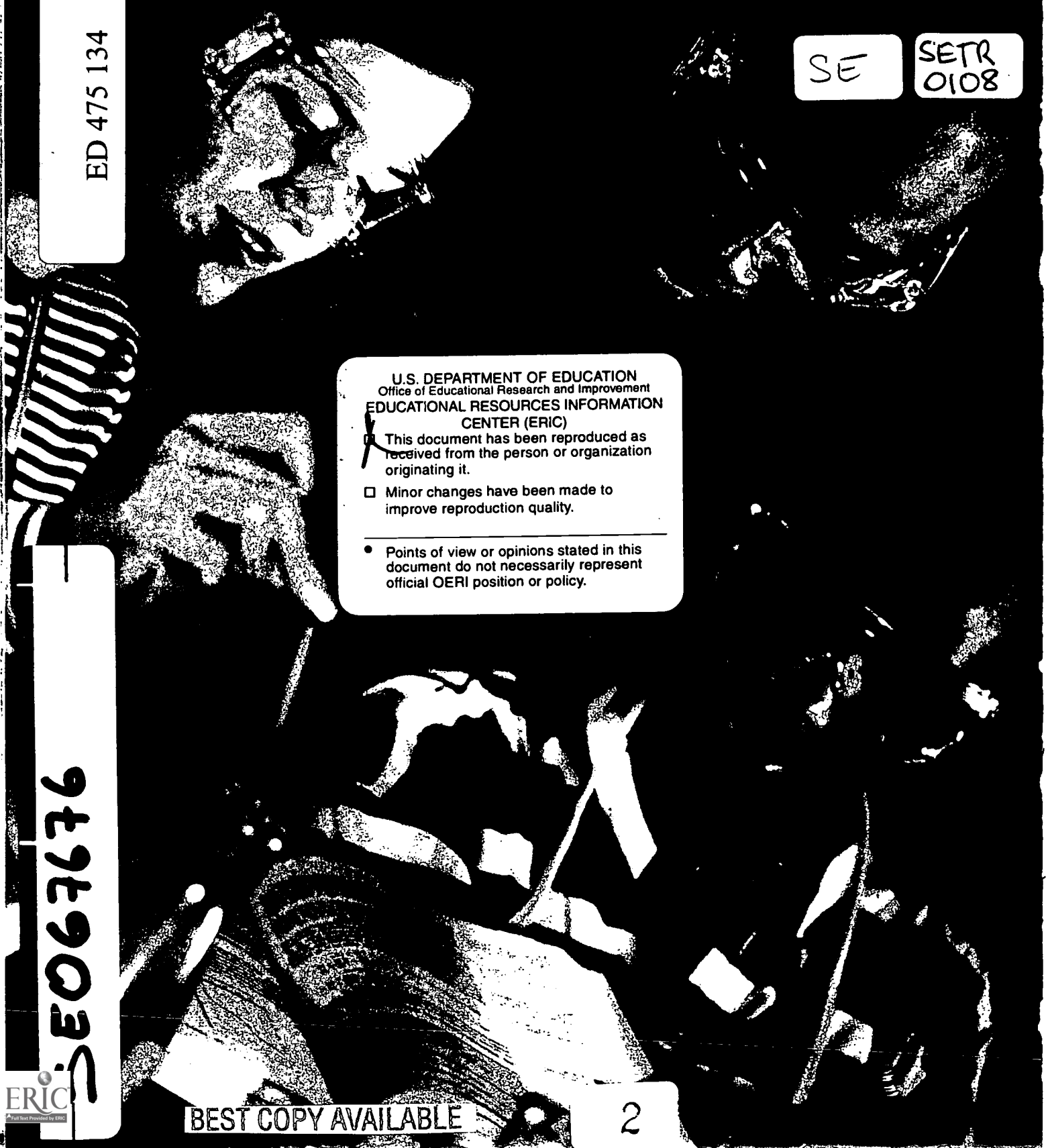

The No Child Left Behind Act of 2001

As a reauthorization of the Elementary and Secondary Education Act (ESEA), Congress passed the No Child Left Behind Act of 2001. Signed into law by President Bush in January 2002, the legislation brings many significant changes to schools nationwide.

According to the U.S. Department of Education, "Among the underlying causes for the poor performance of U.S. students in the areas of mathematics and science, three problems must be addressed—too many teachers teaching out-of-field; too few students taking advanced coursework; and too few schools offering a challenging curriculum and textbooks" (www.ed.gov/offices/OESE/esea/nclb/part6.html). The purpose of this brochure is to help educators in schools and districts understand the fundamentals of what the No Child Left Behind (NCLB) Act means for their mathematics and science curricula. The NCLB Act also emphasizes the importance of Mathematics and Science Partnerships programs.

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Key NCLB Requirements for Mathematics and Science

Annual Student Testing

NCLB requires that states develop and implement annual assessments in mathematics and reading in Grades 3-8 and at least once in Grades 10-12 by the 2005-2006 school year. Beginning in the 2007-2008 school year, schools must administer annual tests in science achievement, at least once in Grades 3-5, 6-9, and 10-12 (*No Child Left Behind: A Desktop Reference*).

Assessments conducted by the National Assessment of Educational Progress (NAEP) will help educators examine their state's standards and assessments in comparison with this independent benchmark. NAEP assessments are not substitutes for states' own assessments of mathematics of all students in Grades 3-8. NAEP will conduct:

- National and state assessments in mathematics at least once every two years in Grades 4 and 8, beginning in the 2002-2003 school year.
- A national assessment in mathematics in Grade 12 at regular intervals.
- Optional assessments in additional subjects such as science in Grades 4, 8, and 12.

The cost of state participation in NAEP will be covered by the federal government.

Challenging Academic Content Standards

Challenging content standards in academic subjects will:

- "Specify what children are expected to know and be able to do"
- "Contain coherent and rigorous content"
- "Encourage the teaching of advanced skills" (Title I, Part A, Subpart 1, Sec. 1111 [D]).

Each state is required to develop its own unique academic standards of achievement of what every student must know in the core subjects of reading, mathematics, and science. Those standards will "include the same knowledge, skills, and levels of achievement expected of all children" (Title I, Part A, Subpart 1, Sec. 1111 [C]). States will also "develop more rigorous mathematics and science curricula that are aligned with challenging State and local academic content standards and with the standards expected for postsecondary study in engineering, mathematics, and science" (Title II, Part B, Sec. 2201 [a-4]).

State-Defined Proficiency Levels

Challenging student academic achievement standards will include at least three levels of achievement—basic, proficient, and advanced. The NCLB Act specifies them as follows:

- Advanced and proficient levels to "determine how well children are mastering the material in the State academic content standards."
- Basic level to "provide complete information about the progress of the lower-achieving children toward mastering the proficient and advanced levels of achievement" (Title I, Part A, Subpart 1, Sec. 1111[D]).

KEY QUESTIONS

What are your state's policies for testing students in grades 3-8 in mathematics, and are they inclusive of students who are economically disadvantaged, from major racial and ethnic groups, have disabilities or limited English proficiency?

How will student science achievement in your state be tested beginning in the 2007-2008 school year?

How has your state defined the three levels of student academic achievement: basic, proficient. and advanced? Who was involved in the process?

Has your state determined the criteria and rigor of what constitutes each academic achievement level for bringing all students to proficiency in at least mathematics and reading in 12 years? How will you ensure that the criteria are applied?

Adequate Yearly Progress (AYP)

The goal is 100 percent proficiency for all students by the year 2014. To achieve that goal. the law requires states to specify and set annual measurable objectives that must rise in equal increments and measure student progress to ensure that all student subgroups—based on poverty, race and ethnicity, disability, and limited English proficiency—are reaching proficiency in reading and mathematics. Annual measurable objectives will be "set separately for the assessments of mathematics and reading" (Title I, Part A, Subpart 1, Sec. 1111 [G]).

Teacher Quality

To ensure teacher quality, "teaching out of field" is no longer acceptable. Title I, Part A, Subpart 1, Sec. 1119 says schools must ensure that every new teacher hired to teach in Title I schools beginning with the 2002-2003 school year is highly qualified. States must ensure that all teachers teaching in core academic subjects of reading, mathematics, and science are highly qualified no later than the end of school year 2005-2006.

Highly qualified teachers will have the necessary subject matter knowledge and teaching skills. States may carry out programs that "establish, expand, or improve alternative routes for State certification" of teachers of mathematics and science, and develop "merit-based performance systems, and strategies that provide differential and bonus pay for teachers in high-need academic subjects such as reading, mathematics, and science and teachers in high-poverty schools and districts" (Title II, Part A, Subpart 1, Section 2113, [c-12]).

Scientifically Based Instruction

Under NCLB, a curriculum must integrate "reliable scientifically based research teaching methods and technology-based methods" to strengthen the core academic program of the school and to measure student progress (Title II, Part B, Sec. 2202).

Technological Literacy and Integration

In the effort to close the achievement gap among students, Title II, Part D aims to help every student cross the digital divide "by ensuring that every student is technologically literate by the time the student finishes the eighth grade." In addition, it encourages effective technology integration into curriculum development and instructional practices.

KEY QUESTIONS

How is your school planning to define and comply with AYP requirements? What measures will be used to document and prove "continuous and substantial improvement" of mathematics and science learning of all students,as well as student subgroups?

What indicators are being used to evaluate mathematics and science teacher quality and subject-matter competency? How are the indicator data being collected? How will the data be used to inform practice and policy decisions?

Is your school or district offering substantive, research-based professional development to mathematics and science teachers that is content-based, sustained overtime. and intended to improve student achievement?

What measures are in place to ensure that a more rigorous mathematics and science curriculum is developed based on solid scientific research? Is the curriculum aligned with challenging academic content standards? If not, how will this be accomplished?

What is your school's capacity in terms of effective technology integration into mathematics and science curricula and instruction?

Mathematics and Science Partnerships

The overarching **goal** of Title II, Part B is to create partnerships to improve academic achievement of students in mathematics and science, raise the standards, as well as provide training for teachers. This program is specifically designed to focus on high-need schools and districts.

The U.S. Department of Education and the National Science Foundation (NSF) are cooperating to support Mathematics and Science Partnerships programs. A **partnership** includes at least a state educational agency (if granted an award); an engineering, mathematics, or science department of an institution of higher education; and a high-need local educational agency. It focuses on:

- The improvement and upgrade of the status and stature of mathematics and science teaching.
- Mathematics and science teacher education as a career-long process.
- Professional development for mathematics and science teachers.
- Mathematics and science curricula development in alignment with challenging academic content standards.
- Teacher training, especially in the effective integration of technology.

Every partnership receiving Title II funds must engage in **activities**, such as creating opportunities for professional development; promoting strong teaching skills; integrating reliable research- and technology-based teaching methods; developing a rigorous curriculum that is aligned with challenging academic content standards. The success of partnerships will be determined based on accountability measures, including student performance, an increased number of students taking advanced courses in mathematics and science, as well as an increased number of teachers seeking careers in mathematics and science.

Funding is available each year through NSF and the Department of Education partnerships programs. Applying for Title II grants requires districts to conduct a needs assessment and develop a local improvement plan, and requires teachers to create an individual professional development plan. The Department of Education will award grants on a competitive basis directly to eligible partnerships for any fiscal year for which appropriated funds are less than $100 million. The Department will allocate funds directly to states on a formula basis, which then will be allocated to eligible partnerships on a competitive basis, for any year that the program is funded for more than $100 million. Grants will be awarded by each state to eligible local partnerships on a competitive basis for a period of three years. Funding through NSF will also be allocated on a competitive basis.

KEY QUESTIONS

How is your school planning to establish a mathematics and science partnership, if any, and to carry out its related activities?

How will the funding for such a partnership ensure student achievement in mathematics and science?

What accountability measures does your school have in place to ensure the success of the mathematics and science partnership?

To what extent are mathematics and science teachers involved in the school improvement process, that is, developing a needs assessment and creating individual professional development plans?

NCREL Key Resources and Products

NCREL offers resources to assist you in understanding and implementing NCLB in your school or district. Visit our Ahead of the Curve Web site containing NCLB information (www.ncrel.org/policy/curve), as well as our home page (www.ncrel.org) for quick links to our various products on teacher professional development, technology integration, curriculum mapping, closing the achievement gap, school reform and improvement. In addition, NCREL currently offers its Quick Key series on the following NCLB content areas: reading, technology integration, schools in need of improvement, and English proficiency.

Teacher to Teacher: Reshaping Instruction Through Lesson Study.
This NCREL/North Central Eisenhower Mathematics and Science Consortium product includes a facilitator's guide and a video, which equip teacher leaders and professional developers to facilitate the lesson study professional development strategy of collaborative planning, teaching, observing, and refining a single lesson. To order copies, send e-mail to ttot@contact.ncrel.org.

Connecting With The Learner: An Equity Toolkit: www.ncrel.org/msc/products/fol.htm
This toolkit on a CD-ROM is designed for professional developers as a series of activities to promote more equitable practice in teaching curriculum and student assessment.

Blueprints: www.ncrel.org/tools/bp/index.html
This practical tool, available on a CD-ROM, is designed to help schools or districts to plan and facilitate professional development. The material is presented via scenarios, followed by recommendations and group processes.

Family of Learners resource CD-ROM: www.ncrel.org/msc/products/fol.htm
This product presents a wealth of resources describing the role and impact community and parents can play in student learning.

enGauge: www.ncrel.org/engauge/
This product is a practical tool for schools and districts as they plan and evaluate the systemwide use of educational technology.

NCREL *Curriculum Mapping* Web site: currmap.ncrel.org/default.htm
This interactive Web site is a practical tool for local school districts interested in "mapping out" new mathematics and science curricula. ***Mathematics Curriculum Mapping Workbook*** and ***Science Curriculum Mapping Workbook*** are paper versions, designed to help schools map out elementary and middle-level mathematics or science curriculum.

NCREL
1120 East Diehl Road, Suite 200
Naperville, Illinois 60563
Phone: (800) 356-2735
Fax: (630) 649-6700
www.ncrel.org

Visit the U.S. Department of Education Web site for detailed information on the No Child Left Behind Act.

No Child Left Behind Act of 2001: **www.ed.gov/legislation/ESEA02/**
No Child Left Behind: A Desktop Reference: **www.ed.gov/offices/OESE/reference.pdf**
No Child Left Behind Act of 2001: Title II, Part B-Mathematics and Science Partnerships: **www.ed.gov/legislation/ESEA02/pg26.html**
No Child Left Behind: **www.nochildleftbehind.gov/**

Key Resources

The following resources have been carefully selected to aid educators in answering the many questions that arise in making important decisions in the process of NCLB implementation:

American Association for the Advancement of Science (AAAS): www.aaas.org
This Web site aims to increase public understanding of science and technology through research-based materials.

The National Academies: www.nas.edu
The National Academies, an umbrella title of four centers, including the National Research Council, is dedicated to providing the nation with the most current scientific and technological issues that affect policymaking.

National Assessment of Educational Progress (NAEP): http://nces.ed.gov/nationsreportcard/nclb.asp
This Web site provides educators with important aspects of NCLB relevant to NAEP, including an assessment schedule, participation, design, and public access information.

National Board for Professional Teaching Standards (NBPTS): www.nbpts.org/index.cfm
Built on the belief that strengthening teaching is the most important step in improving schools and student learning, this Web site offers educators resources on teacher quality and standards.

National Commission on Mathematics and Science Teaching for the 21st Century: www.ed.gov/inits/Math/glenn
The report, titled "Before It's Too Late" aims to ensure that every student in the United States receives excellent instruction in mathematics and science, and sets three main goals as well as strategies for achieving them.

National Council of Teachers of Mathematics (NCTM): www.nctm.org/standards
Principles and Standards for School Mathematics makes recommendations on effective mathematics teaching and provides educators with the guidelines on effective classroom practice.

National Council on Teacher Quality (NCTQ): www.nctq.org
This Web site serves as an information clearinghouse on teacher quality issues, also promoting research and evaluation, as well as public understanding on the teacher quality topic.

National Science Foundation (NSF): www.nsf.gov
A report titled "Preparing Our Children" (www.nsf.gov/pubs/1999/nsb9931/start.htm) focuses on increasing student academic achievement aligned with content standards of what every student must know and be able to do in mathematics and science. Educators can also access the NSF *Mathematics and Science Partnership* page (www.ehr.nsf.gov/msp/).

National Science Teachers Association (NSTA): www.nsta.org/nclbquick
Quick Facts: Highlights of No Child Left Behind for Science and Math Educators lists highlights from NCLB regarding Title II funds for improving teacher quality, including mathematics and science teacher quality. The Legislative Handbook can also be accessed (www.nsta.org/leghandbook).

National Staff Development Council (NSDC): www.nsdc.org/educatorindex.htm
The Web site screens high quality staff development programs that aim to improve the nation's schools.

Program for International Student Assessment (PISA): http://nces.ed.gov/surveys/pisa/
This multinational project was created to evaluate reading, mathematics, and science literacy of 15-year-old students in the United States and participating countries.

Triangle Coalition for Science and Technology Education: www.trianglecoalition.org/nclbres.htm
This NCLB resources page has been created to inform mathematics, science, and technology educators about the key aspects of NCLB and how it will affect math and science education.

2 Plus 2: Mathematically Correct: www.mathematicallycorrect.com
This Web site provides resources geared to improve mathematics education, and it aims to "restore basic skills to math education."

ERIC ICREL
North Central Regional Educational Laboratory
1120 East Diehl Road, Suite 200
Naperville, IL 60563-1486

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