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DRAFT
FOR COMMENT AND REVIEW
Cite as Draft Only

November 1994

**NATIONAL SCIENCE
EDUCATION STANDARDS**

NATIONAL ACADEMY PRESS

Draft for Response and Comment

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Review and Comment Form

for

**Draft National Science Education
Standards**

November 1994

NATIONAL RESEARCH COUNCIL

2101 Constitution Avenue, N.W. Washington, D.C. 20418

NATIONAL COMMITTEE ON
SCIENCE EDUCATION
STANDARDS AND ASSESSMENT

OFFICE LOCATION:
Milton Harris Building, HA 486
2001 Wisconsin Avenue, N.W.
(202) 334-3628
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November 1994

Dear Colleague:

We invite you to participate in an important next step in the development of the *National Science Education Standards* by reviewing this draft. Your review will be a valuable contribution to shaping the science education standards, adding to the extensive review that has taken place throughout their development. We recognize that the draft and review form are long. However, a careful review of selected sections will be more useful than a superficial review of the entire document. We strongly recommend that you carefully read the Introduction before reading other chapters. The Introduction provides a discussion of what science education standards are and what they are not, important definitions that are essential to understanding the document, an explanation of the structure of the draft, and an indication of the role of the standards in improving science education.

The purposes of this review of the draft are to: 1) ensure that the intended messages are communicated clearly, 2) ensure that there is consistency throughout the document, and 3) alert us to perceived problems in the draft.

Do not be constrained by the format of the review form. If you wish to comment extensively on a question or make suggestions for improving a portion of the document, please do so in the comments section, or on a separate sheet of paper and a 3.5" computer diskette. Please key your comments to the question number to which it is related and include a page and line reference when appropriate. Be constructive and suggest how to fix a problem; it is not useful to just say that a section has a problem or needs work.

Please return the review form to the National Research Council, using the address at the end of the form. To be included in the review process, the form must be postmarked no later than February 28, 1995. Based upon your review and those of many others, the final document will be prepared and published later in 1995. You will receive information on how to obtain a copy.

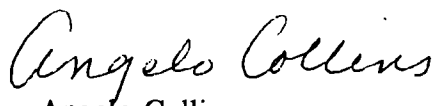
Thank you for your help in developing the *National Science Education Standards*.

Sincerely,



Richard Klausner
Chairman

Sincerely,



Angelo Collins
Director



Raising Standards For American Education

A Report to Congress, the Secretary of Education,
the National Education Goals Panel,
and the American People

The National Council on
Education Standards and Testing

Washington, D.C. January 24, 1992

NATIONAL COUNCIL ON EDUCATION STANDARDS AND TESTING

A LETTER TO CONGRESS, THE SECRETARY OF EDUCATION, THE NATIONAL EDUCATION GOALS PANEL, AND THE AMERICAN PEOPLE

As co-chairs of the National Council on Education Standards and Testing, it is our privilege to present *Raising Standards For American Education*. We believe this report is an important contribution in moving the Nation toward the adoption of high national education standards for all students and a voluntary, linked system of assessments.

Through its deliberations, the Council found that the absence of explicit national standards keyed to world class levels of performance severely hampers our ability to monitor the Nation's progress toward the National Education Goals. We presently evaluate student and system performance largely through measures that tell us how many students are above or below average, or that compare relative performance among schools, districts, or states. Most measurements cannot tell us whether students are actually acquiring the skills and knowledge they will need to prosper in the future. They cannot tell us how good is "good enough".

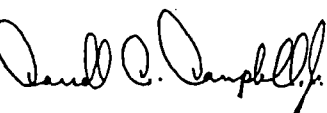
In the absence of well-defined and demanding standards, education in the United States has gravitated toward *de facto* national minimum expectations, with curricula focusing on low-level reading and arithmetic skills and on small amounts of factual material in other content areas. Most current assessment methods reinforce the emphasis on these low-level skills and processing bits of information rather than on problem solving and critical thinking. The adoption of world-class standards would force the Nation to confront today's educational performance expectations that are simply too low.

Explicit and high performance standards could provide an appropriate yardstick against which students, parents, teachers, and others could measure individual and system progress toward the Goals. This information would also help to better direct the use of resources and time. Explicit standards would provide a common anchor for reforms in such areas as assessment, curriculum, instruction, and professional development, thereby promoting systemic rather than piecemeal reform.

The United States enjoys a unique and complex blend of state and local control of education and national purposes for education. We propose to build on this system by setting in motion the appropriate mechanisms that will result in local commitment to high national expectations for achievement for all students. We do not propose a national curriculum. Standards would provide the basic understandings that all students need to acquire, but not everything a student should learn.

Standards and assessments must be accompanied by appropriate federal, state, and local policies that seek to ensure high quality resources, including instructional materials and well-prepared teachers. The considerable technical and political challenges of going forward are detailed in the Council's report. While fully cognizant of these challenges, we urge the Nation and its leaders to move boldly and decisively toward implementation. We strongly endorse national education standards and a voluntary system of assessments as appropriate focal points in ongoing education reform.

Sincerely,



Carroll A. Campbell, Jr.
Governor of
South Carolina



Roy Romer
Governor of
Colorado

Table of Contents

<i>List of Council Members and Affiliations</i>	iv
<i>Executive Summary</i>	1
<i>Part One: Are National Standards and a System of Assessments Desirable?</i>	9
<i>Part Two: Is it Feasible to Develop National Standards and a System of Assessments?</i>	21
<i>Part Three: How Are National Standards and a System of Assessments to be Developed and Implemented?</i>	33
Appendices	
A. Acknowledgments	
B. Authorization for the National Council on Education Standards and Testing	
C. Public Comment	
D. National Education Goals	
E. - L.	
Reports of the Task Forces	

Cover illustration by Mark Nardini

January 24, 1992

iii

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Raising Standards for American Education

Executive Summary

The National Council on Education Standards and Testing was created in response to interest in national standards and assessments by the Nation's Governors, the Administration, and Congress. In the authorizing legislation (Public Law 102-62), Congress charged the Council to:

- advise on the desirability and feasibility of national standards and tests, and
- recommend long-term policies, structures, and mechanisms for setting voluntary education standards and planning an appropriate system of tests.

The work of the Council follows and complements the President's Education Summit with the Governors held in 1989. This important collaborative effort led to the adoption of six National Education Goals designed to engage all Americans, from young children to adults. The National Education Goals Panel was created to report annually on progress toward the Goals. In its first year, the Panel concluded that to meaningfully measure progress on Goals 3 and 4, consideration should be given to creating national education standards that define what students should know and be able to do and to identifying and

January 24, 1992

1

National Education Goals 3 and 4

Goal 3: Student Achievement and Citizenship

By the year 2000, American students will leave grades four, eight, and twelve having demonstrated competency in challenging subject matter including English, mathematics, science, history and geography; and every school in America will ensure that all student learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy.

Goal 4: Science and Mathematics

By the year 2000, U.S. students will be first in the world in science and mathematics achievement.

developing methods to assess students' success in meeting them. The President similarly has called for the creation of World Class Standards for students and high-quality tests on which they can demonstrate achievement of these standards.

In carrying out its charge to examine a broad range of issues, the Council met eight times between June and December, 1991. Task forces were created and produced background papers that informed the Council's discussions. In response to the congressional call for broad public participation, the Council solicited and received public comment from experts and organizations representing a wide range of constituents and interests. This report to Congress, the Secretary of Education, the National Education Goals Panel, and the American people provides recommendations reached after intense deliberation and includes concerns that must be addressed as work progresses on developing standards and assessments.

Desirability of High National Standards and a System of Assessments

In the course of its research and discussions, the Council concluded that high national standards tied to assessments are desirable. In the absence of well-defined and demanding standards, education in the United States has gravitated toward *de facto* national minimum expectations. Except for students who are planning to attend selective four-year colleges, current

education standards focus on low-level reading and arithmetic skills and on small amounts of factual material in other content areas. Consumers of education in this country have settled for far less than they should and for far less than do their counterparts in other developed nations.

High national standards tied to assessments can create high expectations for all students and help to better target resources. They are critical to the Nation in three primary ways: to promote educational equity, to preserve democracy and enhance the civic culture, and to improve economic competitiveness. Further, national education standards would help to provide an increasingly diverse and mobile population with shared values and knowledge.

The Council recommends standards for students and standards for schools and school systems. Student standards include specification of the content — what students should know and be able to do — and the level of performance that students are expected to attain — how good is good enough. The Council envisions that the national standards will include substantive content together with complex problem-solving and higher order thinking skills.

To ensure that students do not bear the sole burden of attaining the standards and to encourage assurances that the tools for success will be available at all schools, the Council also recommends that states establish school delivery standards. System performance standards should also be established. School delivery and system performance standards would attest to the provision of opportunities to learn and of appropriate instructional conditions to enable all children to reach high standards.

In endorsing the concept of national standards for all students, the Council stipulates several characteristics these standards should have:

- Standards must reflect high expectations, not expectations of minimal competency.
- Standards must provide focus and direction, not become a national curriculum.
- Standards must be national, not federal.
- Standards must be voluntary, not mandated by the federal government.
- Standards must be dynamic, not static.

The Council's intent in recommending the establishment of national standards is to raise the ceiling for students who are currently above average and to lift the floor for those who now experience the least success in school, including those with special needs. States should work toward reducing gaps in students' opportunities to learn and in their performance, such as those now associated with race, income, gender, and geographical location.

Having reached consensus that standards are desirable, the Council then determined that it is not sufficient just to set standards. Since tests tend to influence what is taught, assessments should be developed that embody the new high standards. The considerable resources and effort the Nation expends on the current patchwork of tests should be redirected toward the development of a new system of assessments. Assessments should be state-of-the-art, building on the best tests available and incorporating new methods. In order to measure individual student progress and to monitor achievement in attaining the National Education Goals, the new system of assessments should have two components —

- individual student assessments, and
- large-scale sample assessments, such as the National Assessment of Educational Progress.

The key features of both components would be alignment with high national standards and the capacity to produce useful, comparable results. In addition, the system of assessments should have a number of other features.

- The system of assessments must consist of multiple methods of measuring progress, not a single test.
- The system of assessments must be voluntary, not mandatory.
- The system of assessments must be developmental, not static.

As these features are put in place, technical and equity issues need to be resolved, and the overriding importance of ensuring fairness for all children needs to be addressed. Resolving issues of validity, reliability, and fairness is critical to the success of the new system.

The Council concludes that the United States, with appropriate safeguards, should initiate the development of a

voluntary system of assessments linked to high national standards. These assessments should be created as expeditiously as possible by a wide array of developers and be made available for adoption by states and localities. The Council finds that the assessments eventually could be used for such high-stakes purposes for students as high school graduation, college admission, continuing education, and certification for employment. Assessments could also be used by states and localities as the basis for system accountability.

In the Council's view, it is desirable that national content and performance standards and assessments of the standards be established. Doing so will constitute an essential next step to help the country achieve the National Education Goals. Moreover, developing standards and assessments at the national level can contribute to educational renewal in several ways. This effort has the potential to raise learning expectations at all levels of education, better target human and fiscal resources for educational improvement, and help meet the needs of an increasingly mobile population. Finally, standards and assessments linked to the standards can become the cornerstone of the fundamental, systemic reform necessary to improve schools.

Feasibility of Creating National Standards and a System of Assessments

As a first step, the Council recommends that standards be developed in the five core subject areas set out in the National Education Goals — English, mathematics, science, history, and geography — with other subjects to follow. The feasibility of setting national standards and their effectiveness in prompting state and local reform and experimentation is demonstrated by the work of several national professional organizations, a number of states, and other countries. The experiences of the National Council of Teachers of Mathematics (NCTM) and of several states demonstrate that standards-setting is feasible — it is being done. Slowly but surely across the country, states and local districts are responding to the NCTM standards by changing the curriculum and style of teaching to reflect the challenging new standards. The Council recommends national support for such efforts and encourages the work by

professional organizations, states, and localities in articulating standards, curriculum frameworks, and instructional guidelines.

To make national standards meaningful, it is important that the Nation be able to measure progress toward them. New forms of assessments — tests worth teaching to — are envisioned. A system of student assessments linked to world-class standards would provide information that could be used to:

- exemplify for students, parents, and teachers the kinds and levels of achievement expected;
- improve classroom instruction and learning outcomes for all students;
- inform students, parents, and teachers about student progress;
- measure and hold students, schools, school districts, states, and the Nation accountable for educational performance; and
- assist education policymakers with programmatic decisions.

It is unlikely that all of these purposes could be accomplished with the same assessment. Requirements for validity, reliability, and fairness necessitate on-going, independent reviews of the assessments and their uses. Further, particularly for children who have historically experienced less success in schools, such as the poor, ethnic minorities, and students with disabilities, schools should ensure the opportunity to learn as a critical condition for valid and fair use of assessment results.

Some existing assessments may be retained, while others will need to be replaced to avoid adding to the current patchwork. Promising efforts are under way nationally, as well as by states, localities, research institutions, and test publishers using new assessment methods to measure student progress against more demanding curriculum content. Investing in a national system of assessments could lead to more effective and economical use of available resources since it would provide direction and focus to reform efforts. The Council urges support for necessary research and development so that the critical need for assessing students against the yardstick of national, world-class standards can be met.

The Council notes that if they are to be useful, comparable results should be available to all key levels, including individual students and their parents, schools, districts, states, and the

Nation. Assessment outcomes tied to the standards should be widely distributed and communicated in a form that is readily comprehensible to students, parents, policymakers, and the public. States and localities should report results in the context of relevant information on the conditions of learning and students' opportunities to learn.

Developing and Implementing National Standards and a System of Assessments

To ensure that development of national standards and a voluntary system of assessments is done effectively, a coordinating structure needs to be agreed upon and put into place. This structure should benefit from and not duplicate work already being done by existing entities. The Council recommends that a reconfigured National Education Goals Panel and a newly created National Education Standards and Assessments Council work jointly to certify content and student performance standards and criteria for assessments as world class. The Council further recommends that to ensure strong public accountability in this work the Panel would appoint members of the National Education Standards and Assessments Council, which would have the responsibility to coordinate this national effort.

High national standards and a system of assessments, while critically important, are not panaceas for the Nation's educational problems. Other required elements of reform include state curriculum frameworks tied to the standards, professional development opportunities for teaching to the standards, new roles and responsibilities for educators, technology that enhances instructional opportunities, assistance to families and communities in need, incentives to inspire better efforts by students and educators, early intervention where problems are identified, and the reduction of health and social barriers to learning.

Conclusion

The country is engaged in a national debate on what students should know and be able to do and on how to measure

achievement toward those ends. This debate is part of a fundamental shift of perspective among educators, policymakers, and the public from examining inputs and elements of the educational process to examining outcomes and results. The Council initially discussed standards and assessments as a way to help measure progress toward the National Education Goals but came to see the movement toward high standards as a means to help achieve the Goals.

While mindful of the technical and political challenges, the Council concludes that national standards and a system of assessments are desirable and feasible mechanisms for raising expectations, revitalizing instruction, and rejuvenating educational reform efforts for all American schools and students. Thus, the National Council on Education Standards and Testing endorses the adoption of high national standards and the development of a system of assessments to measure progress toward those standards.