

The National Education Standards “Quilts”: A Display Method Aiding Teachers Link NASA Educational Materials to National Education Standards. Rebecca Knudsen and Art Hammon, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena California 91109 (Rebecca.Knudsen@jpl.nasa.gov or ahammon@jpl.nasa.gov); California Institute of Technology, 1200 California Boulevard, Pasadena, California 91125

Introduction: The *National Science Education Standards* (NSES) (1) and National Council of Teachers of Mathematics (NCTM) *Principles and Practices for School Mathematics* (2) were produced to meet a growing concern about consistency and comprehensiveness in American Education. They represent a comprehensive and definitive framework for the creation and implementation of K-12 science and math education. The format of the publications is scholarly and well written. To many educators, the publications in their *book form are difficult to use*. A matrix format developed at Jet Propulsion Laboratory places these standards in a format that can be navigated intuitively by teachers seeking to integrate NASA materials into the structure of standards based education.

The development of rubrics for the placement of products based on readability, conceptual development, safety, room logistics and materials available have been developed to compliment the quilts. The Overarching Science Topics matrix developed by Dr. Robert Gabrys, forum directors and scientists completes the suit of tools needed to fully articulate NASA products to the national science and math standards.

Description: The Standard “Quilt” is a project of the Educational Affairs Office of Jet Propulsion Laboratory and the Solar System Exploration E/PO Forum. The word “Quilt” implies a display of conceptual and process information which produces unique “squares” produced from the *fabric of content and the thematic organizing of those materials*. The document addresses three needs:

1. Users of curricular materials should be helped to seek them based on the standards being taught and age span of students.
2. Producers of curricular materials should display their materials in ways that show their placement in relation to the standards
3. The display of content standards should be articulated to the thematic way in which they will be presented to students.

The standards “Quilt” displays the standards in three ways:

1. The content subject which is the focus of the curricular material
2. The thematic way in which the presentation of the content is displayed
3. The grade spans used by the NSES are blocked as rows.

A beta version of the science quilt was created in CD-ROM format and distributed at science education conferences and workshops nationwide, as was a beta version of the math quilt in hard copy format. Recipients of the quilt were surveyed for feedback and suggestions on these beta versions. The results of the follow-up surveys of the quilt users have indicated a high interest in this product.

Due to the high interest in the quilt, NASA has asked that it become more comprehensive in scope and be developed with the participation of the entire community. Several issues concerning the selection, placement, and display of products on the quilt are currently being addressed.

The development of rubrics for the placement of products based on readability, con-

ceptual development, safety, room logistics and materials available have been developed to compliment the quilts. Microsoft Word readability was chosen as a convenient method of readability assessment. Using the Flesch-Kincaid Grade Level Score method, the rating is based on sentence length and number of syllables. Conceptual levels were derived from chapters in Benchmarks for Science Literacy (AAAS). The sections on Safety, Room Logistics and Equipment were extracted from Environmental Protection Agency publications and NSTA position papers.

The Overarching Science Topics matrix developed by Dr. Robert Gabrys, forum directors and scientists completes the suit of tools needed to fully articulate NASA products to the national science and math standards. This document lists all the major science concepts needed to present the mission science concepts under the forums of the Office of Space Science. A committee directed by Dr. Robert Gabrys of GSFC, scientists and forum directors contributed to the creation of this document.

The most current version of the quilt is available on-line as a testing bed for further evaluation. The reasons for the selection of a web-based format are based on the following assumptions.

1. It is efficient and cost effective--no paper products to ship, distribute or be left behind by educators.
2. Since the activities can be quickly accessed by standards and can be printed as needed and possibly edited, teachers may be more likely to use them.
3. It allows maximum distribution and access to educators as Internet connection has become a top priority for schools nationwide.

An initiative for the verification of product placement and rubrics, as well as the continued evaluation of the quilt, will be undertaken Summer '02 by the JPL education office. Help will be elicited from educators with a wide array of experience in this initiative. The results will provide valuable information for the entire NASA community in their future efforts to align NASA resources to the national educational standards.

References: [1] *National Science Education Standards*, National Research Council, National Academy Press, Washington DC, 1996 [2] *Principles and Standards for School Mathematics*, National Council of Teachers of Mathematics Inc, Reston, VA, 2000 [3] *American Association for the Advancement of Science, Project 2061 (1993). Benchmarks for Science Literacy*. Oxford University Press, Oxford, NY. [4] Environmental Protection Agency. *Glossary of Products with Hazards A to Z*;

<http://www.epa.gov/grtlakes/seahome/housewaste/house/products.htm>

National Science Teachers Association. *An NSTA Position on Laboratory Science*;

<http://www.nsta.org/handbook/labsci.asp>

National Science Teachers Association. *An NSTA Position on Safety and School Science Instruction*;

<http://www.nsta.org/handbook/safety.asp>

National Science Teachers Association. *An NSTA Position on Liability of Teachers for Laboratory Safety and Field Trips*;

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BIOGRAPHY

Rebecca Knudsen works both for the Office of Education and Public Outreach at JPL, and for the OSS Solar System Exploration E/PO Forum. She specializes in educational research and evaluation, with a focus on trends in the K-12 classroom. Some of her research interests include educational technology, curriculum standards correlation, and educational needs assessment. She received a B.S. in psychology from Brigham Young University, and is currently pursuing her graduate studies at Loma Linda University.

BIOGRAPHY

Art Hammon is a Precollege Education Specialist at Jet Propulsion Laboratory. He consults with Solar System missions concerning their Education and Public Outreach. He is the former chair of the New Hampshire State Legislature Distance Learning Commissions, a technology professional development leader and 25 year teacher of Sciences at the middle and high school level. I have taught all levels from grade 3 through 12 and both undergraduate and graduate students for the University System of New Hampshire.

Mr. Hammon's formal education includes a BA and MS in Chemistry, a Diplome de Langue from the Alliance Francaise de Paris in French and 40 hours of graduate coursework in Education and Developmental Psychology.

During his teaching years, he served on a wide variety of boards and committees that developed curriculum for local, state and national groups. He has consulted for 11 years for Operation Physics, a project of the National Science Foundation and American Institute of Physics. This included responsibilities from writing curricula to co-directing the National Training Institute. He served for seven years on the New Hampshire Educational Improvement and Assessment Program, from framework writing to service on the Test Administration and Reporting Committee with oversight of statewide testing.

Mr. Hammon has been an author for Harcourt Brace Publishers in the writing of a six-grade science textbook, a section on Light and Sound

He has been President of the New Hampshire Science Teachers Association and been co-chair of five statewide conventions. Each of these activities involved close collaboration and coordination with educational partners to present these conventions and direct this statewide teachers organization.