**National Science Education Standards: An Overview**

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From National Science Standards documents on the website: <http://www.nap.edu/openbook.php?record> if=4962&page=R1 **On Scientific Literacy:**

In a world filled with the products of scientific inquiry, scientific literacy has become a necessity for everyone. Everyone needs to use scientific information to make choices that arise every day. Everyone needs to be able to engage intelligently in public discourse and debate about important issues that involve science and technology. And everyone deserves to share in the excitement and personal fulfillment that can come from understanding and learning about the natural world.

Scientific literacy also is of increasing importance in the workplace. More and more jobs demand advanced skills, requiring that people be able to learn, reason, think creatively, make decisions, and solve problems. An understanding of science and the processes of science contributes in an essential way to these skills. Other countries are investing heavily to create scientifically and technically literate work forces. To keep pace in global markets, the United States needs to have an equally capable citizenry.

The National Science Education Standards present a vision of a scientifically literate populace. They outline what students need to know, understand, and be able to do to be scientifically literate at different grade levels. They describe an educational system in which all students demonstrate high levels of performance, in which teachers are empowered to make the decisions essential for effective learning, in which interlocking communities of teachers and students are focused on learning science, and in which supportive educational programs and systems nurture achievement. The Standards point toward a future that is challenging but attainable—which is why they are written in the present tense.

The intent of the Standards can be expressed in a single phrase: Science standards for all students. The phrase embodies both excellence and equity. The Standards apply to all students, regardless of age, gender, cultural or ethnic background, disabilities, aspirations, or interest and motivation in science. Different students will achieve understanding in different ways, and different students will achieve different degrees of depth and breadth of understanding depending on interest, ability, and context. But all students can develop the knowledge and skills described in the Standards, even as some students go well beyond these levels.

By emphasizing both excellence and equity, the Standards also highlight the need to give students the opportunity to learn science. Students cannot achieve high levels of performance without access to skilled professional teachers, adequate classroom time, a rich array of learning materials, accommodating work spaces, and the resources of the communities surrounding their schools. Responsibility for providing this support falls on all those involved with the science education system.

Implementing the Standards will require major changes in much of this country's science education. The Standards rest on the premise that science is an active process. Learning science is something that students do, not something that is done to them. ''Hands-on" activities, while essential, are not enough. Students must have "minds-on" experiences as well.

***Changing Emphases (from Page 113)***

The *National Science Education Standards* envision change throughout the system. The science content standards encompass the following changes in emphases:

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| **LESS EMPHASIS ON** | MORE EMPHASIS ON |
| Knowing scientific facts and information | Understanding scientific concepts and developing abilities of inquiry |
| Studying subject matter disciplines (physical, life, earth sciences) for their own sake | Learning subject matter disciplines in the context of inquiry, technology, science in personal and social perspectives, and history and nature of science |
| Separating science knowledge and science process | Integrating all aspects of science content |
| Covering many science topics | Studying a few fundamental science concepts |
| Implementing inquiry as a set of processes | Implementing inquiry as instructional strategies, abilities, and ideas to be learned |
| **CHANGING EMPHASES TO PROMOTE INQUIRY** |   |
| **LESS EMPHASIS ON** | MORE EMPHASIS ON |
| Activities that demonstrate and verify science content | Activities that investigate and analyze science questions |
| Investigations confined to one class period | Investigations over extended periods of time |
| Process skills out of context | Process skills in context |
| Emphasis on individual process skills such as observation or inference | Using multiple process skills—manipulation, cognitive, procedural |
| Getting an answer | Using evidence and strategies for developing or revising an explanation |
| Science as exploration and experiment | Science as argument and explanation |
| Providing answers to questions about science content | Communicating science explanations |
| Individuals and groups of students analyzing and synthesizing data without defending a conclusion | Groups of students often analyzing and synthesizing data after defending conclusions |
| Doing few investigations in order to leave time to cover large amounts of content | Doing more investigations in order to develop understanding, ability, values of inquiry and knowledge of science content |
| Concluding inquiries with the result of the experiment | Applying the results of experiments to scientific arguments and explanations |
| Management of materials and equipment | Management of ideas and information |
| Private communication of student ideas and conclusions to teacher | Public communication of student ideas and work to classmates |