

Foreword

On behalf of the Connecticut State Department of Education (CSDE), I am pleased to present the *Connecticut Academic Performance Test (CAPT) Third Generation Handbook for Science*. The third generation CAPT will be administered for the first time in March 2007.

This handbook has been developed to provide Connecticut's public school educators with important information about the CAPT science subtest. It should serve as a reference for all secondary science teachers as they prepare their students. It is designed to answer the frequently asked questions about this assessment. I urge you to review the handbook, and I hope it will be helpful in your efforts to improve science instruction in Connecticut's classrooms.

Additionally, the CSDE extends its appreciation to those educators who served as members of the CAPT science advisory and fairness committees.

George A. Coleman
Interim Commissioner of Education

Introduction

Like its predecessor, the 2000 CAPT Science Handbook, this *CAPT Third Generation Handbook for Science* has been designed to provide Connecticut's high school science teachers with a range of background materials, ideas, tasks and other resources to better align instruction and assessment with the expectations set by the Connecticut Science Framework and the third generation CAPT science assessment.

The underlying philosophy of the science framework and the CAPT science assessment is that science is not only a body of knowledge, but also a way of thinking about the world around us. The philosophy and objectives closely parallel the National Science Education Standards developed in 1996 by the National Research Council, and *Benchmarks for Scientific Literacy*, published by the American Association for the Advancement of Science in 1993.

In addition to a summary of the changes in the test and the revised test content specifications, this handbook also contains copies of recently released curriculum-embedded tasks and a set of sample items that can be used to assess understanding in each of the CAPT science content domains. Teachers may use these materials in a variety of ways:

- Background materials and teaching suggestions can be shared and discussed at department meetings
- Sample items can be used to prepare ninth and tenth graders for the test, as well as to help prepare eleventh and twelfth graders who choose to retake the test
- Sample items can be used to help teachers to make instructional decisions and to design instructional experiences that are aligned with the CAPT philosophy of science as inquiry
- The curriculum-embedded tasks may be used and/or modified in the normal course of instruction to provide students with a variety of inquiry experiences in science
- Student work generated from curriculum embedded tasks and responses to open-ended questions can be used as catalysts for discussions on teaching and learning

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Connecticut State Board of Education
Hartford

Position Statement on Science Education

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The Connecticut State Board of Education believes that every student needs and deserves a rich and challenging education in science. Such an education will promote essential understandings of the natural world and nurture students' abilities to apply scientific knowledge to make informed and logical judgments about personal and societal issues. Such an education requires that the fundamental approach to science is a creative process for investigating, reasoning, critiquing and communicating about ideas, not as a static body of facts to be memorized.

The Board believes that learning science is important for all students in order to prepare them to be informed individuals and citizens and to participate in a wide range of scientific and technological careers. Understanding the interconnections between science and technology and their shared impact on environmental and societal issues is essential in order to preserve and improve life on Earth.

Learning experiences in science should lead all students to:

- understand and apply basic concepts, principles and theories of biology, chemistry, physics, earth and space sciences and their interrelationships;
- recognize and participate in scientific endeavors which are evidence based and use inquiry skills that lead to a greater understanding of the world;
- identify and solve problems through scientific exploration, including the formulation of hypotheses, design of experiments, use of technology, analysis of data and drawing of conclusions;
- select and use properly appropriate laboratory technology, equipment and materials, including measuring and sensing devices;
- understand and use existing and emerging technologies which have an effect on society and the quality of life, including personal academic and work environments;
- analyze the possibilities and limits of science and technology in order to make and defend decisions about societal issues; and
- understand that the way in which scientific knowledge is formulate is crucial to the validity of that knowledge.

Quality education in science should, therefore, be an integral part of the core curriculum for all Connecticut students. The PreK-12 scientific program should enable students to achieve the learning goals and standards outlined in Connecticut's Science Framework. Improving students' participation and achievement in science is an important component of implementing the Board's education agenda. Everyone has a role in providing all children education that includes rigorous scientific experiences.

The Department of Education plays an essential role in ensuring a quality educational program in science by:

- setting clear goals and core performance expectations for all students, and creating a science curriculum framework that provides a clear PreK-12 scope and sequence necessary to achieve these goals;
- establishing science teaching standards that set high expectations for science content knowledge and pedagogy;
- developing student assessment policies and practices for the state assessment that are aligned with the learning expectations described in the state curriculum framework;
- providing the field with standards-based professional development opportunities to enhance teachers' scientific knowledge and teaching skills; and
- developing statewide partnerships with business, industry and higher education that support scientific learning in schools.

School districts play an essential role in ensuring a quality educational program in science by:

- selecting and developing curriculum and courses of study that are guided by the state science framework;
- providing all students with coordinated, meaningful and engaging scientific experiences to support their development of scientific literacy;
- providing highly qualified teachers at all levels who are knowledgeable about the content, methods and pedagogy of the science they teach;
- applying standards for teaching science to the evaluation of science teachers;
- providing professional development opportunities to science teachers that will enhance the effectiveness of their instruction and improve student learning; and
- providing teachers and students with necessary science instructional resources, including lab space, equipment and materials, technology, textbooks and easy access to electronic sources of information.

Teachers play an essential role in ensuring a quality educational program in science by:

- planning units and lessons that contain current, accurate and meaningful content that is aligned with the district curriculum;
- keeping up-to-date with the latest scientific advances in their discipline;
- setting a context for scientific learning that is relevant to students in class;
- engaging students in extended, developmentally appropriate scientific investigations that motivate student effort and interest in scientific learning;

- providing students with a safe environment in which to participate in scientific investigations;
- providing students with resources needed to support their learning;
- assessing student understanding regularly and adjusting instruction to accommodate students with diverse needs, abilities and interests;
- communicating to students and parents the goals and importance of studying science; and
- encouraging students to pursue the study of advanced science and science-related careers.

Teacher preparation programs play an essential role in improving a quality educational program in science by:

- providing pre-service teachers with a comprehensive program of challenging and meaningful science courses that develop understandings of scientific concepts, processes and ways of thinking;
- providing pre-service teachers with knowledge about human cognition and learning theories;
- providing pre-service teachers with instruction in science-specific classroom pedagogy, including the use of educational and scientific technology, aligned with state science teaching standards; and
- providing pre-service teachers with opportunities to practice teaching in a safe and supportive environment.

Parents play an essential role in ensuring a quality educational program in science by:

- encouraging their children to participate in high-level science courses and activities, both in and out of school;
- talking to their children about science they learn at school and showing interest in scientific content, processes and ideas; and
- providing their children with access to science resources, such as museums, libraries and the Internet.