Wallingford Public Schools
Curriculum Implementation Indicators

INQUIRY-BASED SCIENCE

TEACHER'S BEHAVIORS

_____ Causes students to generate what they already know about a topic and/or as new learning occurs, to compare and contrast new learning with prior knowledge.

_____ Encourages students to look for more than one answer or solution.

_____ Tries to find out what question the student had in mind when he/she responds with an unanticipated answer.

_____ Encourages and/or models the skills of scientific inquiry (see other side for definition)

_____ Models behaviors that characterize science such as curiosity, openness to new ideas, and/or skepticism

_____ Requires students to support generalizations with facts or evidence

_____ Includes safety precautions where needed

STUDENT BEHAVIORS

_____ Students pose problems, ask questions, and try to think of strategies for answering them

_____ Students work with each other, sharing strategies

_____ Students show curiosity, respect for evidence, critical reflection, flexible thinking, and/or sensitivity to living things.

_____ Students gather their own evidence

_____ Students defend the evidence they have gathered

_____ Students express results in more than one way (speaking, charts, graph, writing, presentations)

NATURE OF ACTIVITY

_____ Logical sequence of related activities builds conceptual understanding over three or more lessons.

_____ Experiments and activities lead to understanding of basic principles. (Example: Things that make sound vibrate.)

_____ Focus is on concrete experiences with scientific phenomena

_____ Activity requires students to apply knowledge and/or skills to new situations and/ or real life.

_____ Provides opportunity to investigate an important science concept in depth.

INQUIRY

NOTE: Although we emphasize inquiry, this should not be interpreted as recommending a single approach to science teaching. Teachers should use a variety of strategies to develop the knowledge, understanding, and skills described in the scope and sequence.

Scientific inquiry is a complete activity that needs to be open-ended and flexible in some ways, while using a number of process skills. These processes are not lockstep, one-after-the-other phases in some ideal scientific methods. At any state, one may need to jump back to another stage. Real science is a complex mixture of organized inquiry and intuitive playing around with ideas and possibilities. The book, *Best Practice,* describes the processes as:

QUESTIONING The teacher or student introduces a problem, incites curiosity, or invites recall of personal experience with a natural phenomenon. Students discuss and list what they know or think they know about the problem and questions they have. Often a demonstration of contradictory or puzzling outcomes helps raise such questions.

OBSERVATION Students gather data, at first in an exploratory way to probe the question. They begin to propose hypotheses to explain variation they find. This leads to more focused observation to test the hypotheses.

ORGANIZING DATA This may overlap with observation. Students focus on looking for patterns or differences.

EXPLANATION Students may be able to discern a cause or theory to explain differences. With more complex phenomena, reading, textbooks, or a teacher' s expert input will be needed and, by this stage, welcomed.

REFLECTION Review of the process, obstacles, and how these were addressed, then makes students aware of the concepts, problem solving, and thought processes they have learned in the course of the inquiry.

TAKING ACTION Some topics with technological implications can result in responsible action in the larger community. Others lead to further scientific questions the students realize remain unanswered, thus encouraging students to continue learning.

The Science Curriculum Management Team is recommending a balance of:

TYPE OF EXPERIENCE	WHO CONDUCTS & HOW	TEACHER'S PURPOSE(S)	STUDENT RESULTS
Demonstration	Teacher or a selected student shows the group how something is done.	To motivate questions, to teach a skill, or demonstrate a concept.	Students gain general awareness and may become motivated to ask questions.
Recipe-based Lab	Students follow specific step-by-step procedures prescribed by the teacher.	To develop and practice skills with laboratory equipment, to develop a model or base of understanding that will be used in inquiry-based labs, to model scientific processes	Students practice collecting, organizing, and analyzing data. They use data to support valid conclusions. They practice using equipment. They may generate questions to explore as a result.
Inquiry-based Lab	Students and/or the teacher generate the problem and questions. The students generate the procedures with the teacher acting as a coach.	To have students use scientific processes to solve problems, to have students apply knowledge and skills	Students are able to communicate a purpose, design steps to attempt to solve a problem, and learn to validate results to explain both verbally and in writing.