

SCIENCE HABITS OF MIND
SIXTH THROUGH EIGHTH GRADE

I. VALUES AND ATTITUDES

By the end of eighth grade, students should:

- A. Know why it is important in science to keep honest, clear, and accurate records.
- B. Know that hypotheses are valuable, even if they turn out not to be true, if they lead to fruitful investigations.
- C. Know that often different explanations can be given for the same evidence, and it is not always possible to tell which one is correct.

II. COMPUTATION AND ESTIMATION

By the end of the eighth grade, students should be able to:

- A. Find what percentage one number is of another and figure any percentage of any number.
- B. Use, interpret, and compare numbers in several equivalent forms such as integers, fractions, decimals, and percents.
- C. Calculate the circumferences and areas of rectangles, triangles, and circles, and the volumes of rectangular solids.
- D. Find the mean and median of a set of data.
- E. Estimate distances and travel times from maps and the actual size of objects from scale drawings.
- F. Insert instructions into computer spreadsheet cells to program arithmetic calculations.
- G. Determine what unit an answer should be expressed in from the units of the inputs to the calculation, and be able to convert compound units (i.e. mph into feet per second).
- H. Decide what degree of precision is adequate and round off the result of calculator operations to enough significant figures to reasonably reflect those of the inputs.
- I. Express numbers like 100; 1,000; and 1,000,000 as powers of 10.
- J. Estimate probabilities of outcomes in familiar situations, on the basis of history or the number of possible outcomes.

III. MANIPULATION AND OBSERVATION

By the end of the eighth grade, students should be able to:

- A. Use calculators to compare amounts proportionally.
- B. Use computers to store and retrieve information in topical, alphabetical, numerical, and key-word files, and create simple files of their own devising.
- C. Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, and temperature, and choose appropriate units for reporting various magnitudes.
- D. Use cameras and tape recorders for capturing information.
- E. Inspect, disassemble, and reassemble simple mechanical devices and describe what the various parts are for; estimate what the effect that making a change in one part of a system is likely to have on the system as a whole.

IV. COMMUNICATION SKILLS

By the end of eighth grade, students should be able to:

- A. Organize information in simple tables and graphs and identify relationships they reveal.
- B. Read simple tables and graphs produced by others and describe in words what they show.
- C. Locate information in reference books, back issues of newspapers and magazines, compact disks, and computer databases.
- D. Understand writing that incorporates circle charts, bar and line Graphs, two-way data tables, diagrams, and symbols.
- E. Find and describe locations on maps with rectangular and polar coordinates.

V. CRITICAL-RESPONSE SKILLS

By the end of the eighth grade, students should:

- A. Question claims based on vague attributions (such as "Leading doctors say...") or on statements made by celebrities or others outside the area of their particular expertise.

- B. Compare consumer products and consider reasonable personal trade-offs among them on the basis of features, performance, durability, and cost.
- C. Be skeptical of arguments based on very small samples of data, biased samples, or samples for which there was no control sample.
- D. Be aware that there may be more than one good way to interpret a given set of findings.
- E. Notice and criticize the reasoning in arguments in which (1) fact and opinion are intermingled or the conclusions do not follow logically from the evidence given, (2) an analogy is not apt, (3) no mention is made of whether the control groups are very much like the experimental group, or (4) all members of a group (such as teenagers or chemists) are implied to have nearly identical characteristics that differ from those of other groups.