

U.S. Performance in Problem Solving

As noted, one of PISA's major goals is to assess skills that cut across traditional curricular areas. In 2003, PISA assessed students' abilities in problem solving.⁷

Problem solving is defined as:

...an individual's capacity to use cognitive processes to confront and resolve real, cross-disciplinary situations where the solution is not immediately obvious, and where the literacy domains or curricular areas that might be applicable are not within a single domain of mathematics, science, or reading. (OECD 2003, p. 156).

Students completed exercises that assessed their capabilities in using reasoning processes not only to draw conclusions but to make decisions, to troubleshoot (i.e., to understand the reasons for malfunctioning of a system or device), or to analyze the procedures and structures of a complex system (such as a simple kind of programming language). Problem-solving items required students to apply various reasoning processes, such as inductive and deductive reasoning, reasoning about cause and effects, or combinatorial reasoning (i.e., systematically comparing all the possible variations which can occur in a well-described situation). Students were also assessed in their skills in working toward a solution and communicating the solution to others through appropriate representations. Sample problem-solving items and student responses are shown here.

For more information about the problem-solving framework, please refer to *The PISA 2003 Assessment Framework: Mathematics, Reading, Science, and Problem Solving Knowledge and Skills* (OECD 2003).

Additional released problem-solving items can be found at <http://nces.ed.gov/surveys/pisa>.

⁷PISA 2003's problem-solving assessment focused explicitly on problem-solving skills, using a variety of contexts, disciplines, and problem types. The items used to measure problem solving in PISA 2003 were different from other items, such as those measuring mathematics literacy. Problem solving can also be embedded within measures of content areas such as mathematics or science, however. TIMSS 2003, for example, incorporated an explicit aspect of problem solving and inquiry into the description of desired outcomes for mathematics and science. A review of mathematics and science items in PISA and TIMSS showed that 38 percent of eighth-grade TIMSS 2003 mathematics items and 48 percent of PISA 2003 mathematics literacy items measured some aspect of problem solving; additionally, 26 percent of eighth-grade TIMSS 2003 science items and 49 percent of PISA science literacy items measured problem-solving skills (Dossey, O'Sullivan, and McCrone forthcoming).