

Strategic Competence

“Although in school, students are often presented with clearly specified problems to solve, outside of school, they encounter situations in which part of the difficulty is to figure out exactly what the problem is. Then they need to formulate the problem so that they can use mathematics to solve it. Consequently, they are likely to need experience and practice in problem formulating as well as in problem-solving.”

“Becoming strategically competent involves an avoidance of ‘number grabbing’ methods (in which the student selects numbers and prepares to perform arithmetic operations on them) in favor of methods that generate problem models (in which the student constructs a mental model of the variables and relations described in the problem). To represent a problem accurately, students must first understand the situation, including its key features.”

“In a common superficial method for representing this problem, students focus on the numbers in the problem and use so-called keywords to cue appropriate arithmetic operations. In contrast, a more proficient approach is to construct a problem model— that is, a mental model of the situation described in the problem. A problem model is not a visual picture per se; rather, it is any form of mental representation that maintains the structural relations among the variables in the problem.”

“Routine problems are problems that the learner knows how to solve based on past experience. When confronted with a routine problem, the learner knows a correct solution method and can apply it. Routine problems require reproductive thinking; the learner needs only to reproduce and apply a known solution procedure. In contrast, non-routine problems are problems for which the learner does not immediately know a usable solution method. Nonroutine problems require productive thinking because the learner needs to invent a way to understand and solve the problem.”