ABSTRACT

This thesis consists of five papers one of which summarizes the other four.

The thesis deals with novice problem solvers' use of knowledge and detection of errors. In addition, how solvers generate errors, and differences between good and poor solvers are investigated. Problem solving is seen as a process, the outcome of which depends on the solvers' knowledge and how that knowledge is utilized (problem solving technique). In three of the studies, the subjects were asked to think aloud while solving two (or three) statistical problems. The empirical results of the studies include the following. Solvers' use of knowledge was found to be deficient in various ways, e.g. the use of conceptual knowledge was found to be insufficient. The ability to detect one's own errors was found to be important for successful problem solving. Different aspects of the solvers' detection of their own errors were studied. Most of the error detections were found to occur either in a quick one-step process or in a prolonged multi-step process triggered when the subjects reacted in a negative way to some aspect of their solution. Various methods to make subjects detect their own errors were attempted and the causes of the moderate success of these attempts were analyzed. Finally, good and poor solvers were, generally speaking, found to differ in the degree to which they utilized an understanding oriented approach. Good solvers' greater ability to detect their own errors appears to depend partly on advantages in the early stages of the error detection process. Some practical implications of these and other results are discussed.

Key words: Problem solving, error detection, errors, use of knowledge, individual differences.