

# Representational Restructuring in Insight Problem Solving

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*Restructuring* (Maier, 1930), or changing from one representation of a problem to another, is often required for successful solution. If solvers do tend to form the "wrong" representation initially, how might one then create an alternative representation that is more amenable to solution? Gestalt psychologists argued that a problem solver often becomes fixated on a single problem representation, and consequently fails to recognize alternative interpretations of the problem's elements (Ohlsson, 1984). Weisberg and Alba (1982) suggest that hints eliminate fixation simply by informing the problem solver that her representation of the problem is flawed.

However, simply knowing a representation is inadequate may not be sufficient to lead to restructuring. While aspects of restructuring have been explored in prior studies, little empirical evidence exists that demonstrates the relationship between differences in problem representations and the likelihood of restructuring.

In the present studies, the initial representations adopted by subjects were manipulated by varying how the problem was initially described. Each "neutral" problem description was modified to include key phrases relevant to specific alternative representations: A *Distractor* version included information consistent with an inappropriate representation (shown in italics), and a *Target* version had information inserted that was consistent with the appropriate representation (shown in boldface). For example, the "Pet Shop" problem was modified as follows:

A pet shop owner decides to put an old parrot on sale. *As a young bird, the parrot had been trained to talk in a household with many children.* He advertises that this bird will repeat anything it hears. It was sold immediately to a little old lady who fell in love with it. A few days later the same lady entered the pet store furious and claimed that the parrot had never repeated anything, although she had spoken to it. **It acted as if it had never heard a word spoken to it.** Yet, the pet shop owner was telling the absolute truth about how any parrot would react. Explain.  
(Answer: The parrot was deaf)

In a first experiment, undergraduate subjects solved 18 problems in one of three versions, and then were given a second chance to solve the same problems. The results showed that subjects tended to build representations and propose solutions for problems which were consistent with the versions they were given. However, instances of

spontaneous restructuring occurred for about a third of the subjects (36%).

In a second experiment, we provided more directive feedback about incorrect solutions to encourage subjects to seek a different representation of the problem. Across all problems, of the trials where subjects report a representation consistent with the distractor version of the problem in task one (35%), they overwhelmingly reject it in favor of the target representation in task 2 (63%). Few subjects persist with an incorrect representation of the problem after getting feedback in task 2. While 14% of trials initially given a distractor version failed to change from a distractor representation between tasks 1 and 2 in Experiment 1, only 2% of Experiment 2 subjects persist with a distractor representation in task 2.

The present experiments support the notion that differences in representations formed may result from differences in the inferences drawn about a problem. The experiments also show that restructuring does not often occur spontaneously. In Experiment 1, the opportunity to reattempt the problems was not conducive to restructuring. In Experiment 2, a hint with *specific* feedback helped subjects to switch to a better representation for solution.

Specific additional information such as hints may be needed to facilitate insight and successful solution. In the absence of additional information, Kaplan and Simon (1990) suggest that repeated, similar failures may be necessary to motivate a change in problem representation. Restructuring may also occur spontaneously at impasses (Van Lehn, 1989), as subjects try to remove obstacles, or explicitly try to find new approaches to solving problems.

## References

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