

How do Presentation and Context Influence Representation for Functional Fixedness Tasks?

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A truism in many kinds of problem solving is that if the problem is set up right, the solution is obvious. The trick lies in finding the best way to represent the task. Functional fixedness tasks are tasks modeled around this “trick”—in order to solve them optimally, participants need to use objects in a novel way.

In the candle task, first described in Maier (1931), participants must use a box of tacks and a book of matches to mount a candle on a wall so that it can burn normally and without dripping. The optimal solution is to take the tacks out of their box, tack the box to the wall, and place the candle on the box, but participants only discover this solution approximately one quarter of the time. On the other hand, if the tacks are presented next to the box instead of inside it, the task is trivial. The candle task is a functional fixedness task because in order to solve it, participants must overcome their representation of the box as having a fixed function as a container in order to represent it as a possible support for the candle.

In a classic study, Glucksberg & Weisberg (1966) revealed that participants who failed to produce the correct solution were subsequently less likely to produce the word “box” in a free association task, leading Glucksberg and Weisberg to conclude that participants failed to overcome their functional fixedness because did not have the “box” concept available to them.

In a study, conducted on 68 undergraduate students at Stanford University, we tested the veracity of this view by presenting participants with written descriptions of the candle task and asking them to describe any solution they could find. In all of the conditions, the participants were presented with the word “box” so that the lexical concept was explicitly available in the stimuli. In the control condition, the text of the problem was printed unmodified. In the first experimental condition, the phrases “candle,” “book of matches,” and “box of tacks” were underlined. In the second experimental condition, the words “candle,” “book,” “matches,” “box,” and “tacks” were all underlined. The percentage of solution in the first condition was 23%, whereas the percentages in the other two were 55% and 47%, respectively. T-tests showed there was a significant difference both between the control condition and the second condition ($p < .05$) and between the control and the third condition ($p = .05$).

These results were confirmed by a second study that tested the effects of underlining the word “box” or

underlining all relevant nouns except “box.” This second study produced the same pattern of results.

The difference between solvers and non-solvers in these studies cannot be explained simply in terms of the lexical concept “box” being available to one but not the other group in this instance. All our participants were presented with the lexical concept “box”. Rather, whether or not participants solve the candle task seems to depend on whether they instantiate a partial representation of “box” or a more complete one. Since finding an optimal solution for functional fixedness tasks depends crucially on this shift in representation, a more flexible view of representation appears to be necessary to give an account of how participants solve and fail to solve the tasks.

These data suggest that in order to model the processes of representation that are going on when participants attempt to solve functional fixedness tasks (and other types of insight problems) we will need to move away from simple “atomic” approaches to the representation of lexical concepts, and move instead to a more flexible representation model that can account for quick shifts in the representations of objects based on small differences in presentation (or attention).

In further studies we will examine the question of how the presence of non-essential constituents in the task setup can influence participants’ reasoning process and hence their representations of the objects used in the solution. Our aim is to investigate what kind of an effect external contextual cues can have on participants’ ability to solve functional fixedness tasks and their speed of solution.

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References

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