Skill Acquisition and the Problems of Transfer

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In this set of studies, we investigated how people acquire and use knowledge by having subjects learn a new task under two types of training conditions. The task used was a variant of the alphabet addition task developed by Logan (1988). With this task, subjects are required to solve problems of the following format: *Letter 1* + *Number* = *Letter 2*. For example, given the problem C + 3 =, the subject should respond F.

In one training condition (varied), subjects received training that was designed to give them practice counting up the alphabet to derive answers. This was accomplished by giving subjects extended practice with 72 different problems and little practice on any given problem. The 72 problems were presented 6 times so that subjects had to solve a total of 432 problems. In the second training condition (same), subjects were presented with a set of 12 problems on which they received extended practice. Each problem was presented 32 times so that each subject also had to solve 432 problems. After the training session, both groups of subjects received a transfer task. The specific transfer task and instructions given varied from study to study, but using this methodology, we were interested in how the different types of training conditions facilitated different types of knowledge acquisition and differences in how knowledge can be accessed.

Rabinowitz and Goldberg (1995) demonstrated that the two types of training conditions produced significantly different learning curves. While subjects in the two training conditions initially start the task with equivalent reaction times, subjects in the "same" training condition were significantly quicker than subjects given the "varied" training at the end of training.

What was of interest, however, was how the two groups varied on different transfer tasks. For example, if the transfer task consisted of a new set of alphabet arithmetic problems to solve, subjects who initially received the "varied" training were significantly faster than those who received the "same" training. However, if the transfer task consisted of a set of alphabet subtraction problems, where the subtraction problems were the inverse of the addition problems the "same" group practiced during training, the "same" condition subjects showed significant benefits during transfer as compared to the "varied" training subjects.

The following set of studies were designed to further explore the conditions under which subjects could make use of their knowledge. In the first study, we were interested in assessing whether subjects could discriminate old problems from new ones. On the transfer task, the 12 old problems were combined with 24 new problems. Subjects who were initially given "varied" training were not able to discriminate old from new. However, overall, subjects who were given the "same" training were faster on the old problems than the new ones. However, there was some indication that there was an individual difference component to this finding, in that not all subjects showed this effect. In Study 2, we conducted a similar manipulation on the transfer task, except this time with alphabet subtraction problems. The 12 alphabet subtraction problems that were the inverse of the training problems were mixed in with 24 unrelated alphabet subtraction problems. In this context, subjects from both training groups showed little benefit from their initial training. However, in this same study we did replicate the finding that if you present the 12 inverse problems by themselves, subjects initially given the "same" training showed significant benefits.

In Studies 3 and 4, we wanted to explore what effect informing subjects about the distinction between new and old had on their performance. In both of these studies we only conducted the "same" training condition. In Study 3, on the transfer task, half the subjects were told that some of the problems that they will see were problems that they saw during training and that some would be new. The other half of the subjects were not informed about the nature of the problems. Overall, subjects showed that they could discriminate old from new. However, for subjects who did not discriminate, informing them about the problems had no significant effect on reaction times.

In Study 4, on the transfer task, half the subjects were told that some of the alphabet subtraction problems will be the inverse of the problems they saw during training and some will be new. The other half of the subjects, once again were not informed about the nature of the problems. Once again, there was very little transfer in this condition and informing them about the problems had no significant effect on reaction time. However, when differences in error rates were investigated, the informed group had significantly fewer errors on the inverse problems.

References

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