Applying Cognitive Psychology Methods Activity 4: Problem-Solving and Creativity

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Problem-Solving Tasks

Task 1

From Table 1, we know the Queen can only be in the middle or right column. Similarly, the Jack can only be in the left or middle column. Whereas the King could be in any row. This implies that the Queen must be in the right column but does not give us enough information for the position of the King or the Jack.

We know the Spade must be in the right column because it is the only suit that is present. This means the right card must be a Queen of Spades. From here, we can construct Table 2 that will have more restrictions which will allow us to decipher the remaining 4 variables.

From Table 2, can make out that since the King must be to the right of the Spade, it can be in either the left or middle column. The same argument for the Jack, only instead of a Spade, it needs to the left of the Queen. Because the Diamond needs to be to the left of the Spade, and the King needs to be to the right of the Heart, that means the Jack must be a Heart and must be in the left column. This leaves the King and the Diamond suit to be in the middle. We know this works because the King is to the left of the Spade, and the Diamond is also to the left of the Spade. This leaves us with the Table 3.

Task 2

For this task, we need to find the worst-case scenario for the maximum number of coins needed. To ensure that we will always be able to fill the interval of $1 \leq 10$, we would need at least 1 dime, and at most 1 nickel, and 4 pennies. Now that we have found the lowest number of coins needed for any amount less than or equal to 10, now we need to find the next lowest amount before we hit the next denomination. Thus, for the interval $1 \leq 25$, we need 2 dimes and 4 pennies for the worst-case scenario, and 1 quarter for the best case scenario. With the addition of a quarter to this total, we have made up all amounts $1 \leq 50$. Thus, with the addition of a half-dollar, we covered all amounts $1 \leq 100$. This means for any amount $1 \leq 100$, we would need 4 pennies, 1 nickel, 2 dimes, 1 quarter, and 1 half-dollar. This is shown in Table 4.

Creativity Tasks

Task 3

This task is answered in Table 5.

Evaluation Questions

Problem-Solving Tasks

1. Describe how you solved each problem. What strategies did you use? (make sure to mention any *restructuring* **or** *insights* you experienced) **(6 pts)**

   > ***Solution.*** For the first task, I started by simply following the rules that were laid out in front of me. I made a table to visualize more easily what the rules dictated, and then I tried to solve it from there. At first, I thought the rules implied that the suit or card must be *directly* next to whatever it was stipulating, but I knew I needed to *restructure*—change the problem's representation—when I was stuck with 4 rows, and only 1 item in the left column.
   >
   > Thus, I redid the problem, and this time when the rule said "to the left (or right)," I made sure to add the requisite content to both columns (if applicable) instead of one. After changing up my strategy and by interpreting the rules differently, I was able to solve the problem.
   >
   > For the second task I really struggled. I read the directions in every way except the correct way. It wasn't until I showed the problem to my friend, who had an *insight*—a sudden realization of an interpretation that was not initially obvious—that I was able to solve it. After that, I went through each interval that made up $1 \leq 100$, and I was able to visualize it differently, like in Table 4.

2. Describe any obstacles you faced in solving these problems – or, if you did not, how might *mental set* **or** *functional fixedness* play a role. **(4 pts)**

> ***Solution.*** With the first task, I struggled with a mental set—a preconceived notion of how to solve a problem. I was stuck on the idea that the suit or card must be *directly* next to whatever it was stipulating. This is because when I was told it needs to be "to the left (or right)" in the past, I always positioned it *directly* next to it.
>
> When starting on the second task, I initially tried to utilize *divergent thinking*—thinking that is open-ended, involving many potential "solutions." I restructured the problem in 3 different ways, and each way seemed to be overly complicated. I knew that I was missing something, but I was unable to break out of my *fixation*—tendency to focus on a specific characteristic of the problem that kept me from solving it. Thus, I worked harder to force the problem into something it was not.
>
> While I wouldn't say I was *functionally fixed*—the inability to see an object as being able to fulfill a function other than its intended one—I was engaging in *confirmation bias*—the tendency to search for, interpret, and favor information that confirms one's preexisting beliefs or hypotheses.

3. For each task, describe at least one other cognition that you employed (e.g., working memory, attention) and describe how that cognition is connected to problem-solving. (Make sure to include all relevant components of your cognition and define those components) **(15 pts)**

> ***Solution.*** For the first task, I used my *working memory*—a limited-capacity system for temporary storage and manipulation of information for complex tasks like comprehension—to understand the task, to keep track of the rules that were given to me, and assign cards based on that rule. Because my *control process*—strategy I used to help make a stimulus more memorable—was not employing proper *rehearsal*—repeating a stimulus over and over—I kept forgetting how each rule interacted with each other.
>
> As a consequence of continuously forgetting previous rules after I went onto the next,

I was engaging in *maintenance rehearsal* because I was not associating any of the past rules with any new rule I was given. This was a problem because I was not able to *chunk*—grouping items into a single unit—the rules together, and thus I was not able to solve the problem.

As for the second task, I when I tried using my *working memory*, my *long-term memory*—a system for storing, managing, and retrieving information for later use—was working against me with *proactive interference*—the disruptive effect of prior learning on the recall of new information. Because I am a part of various math courses, I was able to see the problem in many ways, but I was unable to see it in the way that was needed to solve it.

4. Evaluate these tasks. Is each one a good test of problem-solving? Why or why not? **(3 pts)**

   Solution. These tasks were a good test of problem-solving. I used a variety of strategies to solve each problem, and I was able to solve them in the end. The first task was novel to me, and so I needed to think of novel strategies to solve it. The second task required me to think about the problem differently than I was used to.

Creativity Task

5. Describe how you solved each test (coming up with the correct words). Did you use strategies? If so, what did that process look like? **(4 pts)**

   Solution. For each test, I tried to think of synonyms for each word, and see if any of the words shared a common synonym. If that didn't work, I looked at different ways the terms could be viewed. For example, "Scotch" could be a drink, but it could also be a type of tape, or even a dish (like Scotch eggs).

6. How does this task engage controlled processes? How does it engage associative processes? **(15 pts)**

> ***Solution.*** First, this task engages *controlled processes*—associated with how you manage your attention, your ability to *task-switch* (consciously move from one task to another), and *working memory*—by requiring me to give my attention to the task at hand. Additionally, when the task may be too difficult, it allows me to move from one list to another. When I bounce from list to list, I am using my *associative processes*—ability to retrieve associations from memory—to try to find a connection between the words. Thus, this task required me to use a combination of both processes to solve it.

7. Evaluate this task. Is it a good test of creativity? Why or why not? **(3 pts)**

> ***Solution.*** Yes, it was a good test of creativity. It required a lot of deep thinking, and took time to solve. It was not extremely easy, or extremely hard. Furthermore, it was a good balance of difficulty, and required me to think differently than I was used to.

Possibilities	Left	Middle	Right
1a	Jack	Queen	—
1b	Jack	Jack	Queen
2a	Diamond	Spade	—
2b	Diamond	Diamond	Spade
3a	Heart	Heart	King
3b	Heart	King	—
4a	—	King	Spade
4b	King	Spade	Spade

Table 1

Initial Setup Adhering to All Rules

Possibilities	Left	Middle	Right
1b	Jack	Jack	Queen
2b	Diamond	Diamond	Spade
3b	Heart	King	—
4a	—	King	Spade

Table 2

Queen of Spades in Right Column for Restriction

Possibilities	Left	Middle	Right
1	Jack of Hearts	King of Diamonds	Queen of Spades

Table 3

Final Table

Intervals	Pennies	Nickels	Dimes	Quarters	Half Dollars
$1 < 5$	4	0	0	0	0
$1 < 10$	4	1	0	0	0
$1 < 15$	4	1	1	0	0
$1 < 25$	4	0	2	0	0
$1 < 35$	4	1	0	1	0
$1 < 50$	4	1	1	1	0
$1 < 100$	4	1	1	1	1

Table 4

Minimum Coinage

List	Your Answer
Falling Actor Dust	Star
Broken Clear Eye	Glass
Skunk Kings Boiled	Cabbage
Widow Bite Monkey	Spider
Bass Complex Sleep	Deep

List	Your Answer
Ink Herring Neck	Red
Measure Desk Scotch	Tape
Strike Same Tennis	Match
Athletes Web Rabbit	Foot
Board Magic Death	Black

Table 5

Remote Associations Tasks