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Engineering: The E in STEM

On-Line Problem Solving Project

## Part I

1. Which problems did you work through?

I tried all of them.

2. Which problem was the easiest to solve?

Trio Match

3. Why was it easy to solve?

The strategy was very simple and repetitive. Without a time constraint, I was able to take my time and sort the shapes correctly.

4. What type of problem was it (see Kirkley, 2003 article pg. 8)? Explain.

This was a moderately-structured problem. I was able to use the same strategy repeatedly, but there were many possible answers.

5. What strategy did you use to solve the problem?

I used a simple sorting strategy. First, I tried to make blue, red, and green sets. When I couldn't do that, I tried to put different shapes together.

6. How did you develop this strategy?

I was able to develop this strategy while I read the directions.

7. What declarative knowledge was needed to solve this problem?

Factual declarative knowledge was needed to solve this problem as it was necessary to recall the directions and the point assignments.

8. What procedural knowledge was needed to solve this problem?

I used two simple sorting strategies over and over to solve this problem. The sorting procedures quickly became automatic.

## Part II

9. Which problem was the most challenging for you to solve?

I found “Entrapment” to be the most challenging problem.

10. Why was it difficult to solve?

I found this problem difficult to solve because I could not follow a set procedure as I did for most of the others. Even with careful thought and planning, I could not solve all of the puzzles.

11. What type of problem was it (see Kirkley, 2003 article pg. 8)? Explain.

I believe that this was an ill-structured problem. The directions were vague and it took me a few attempts to understand that I needed to construct some sort of triangle. In addition, I needed to look at the arrangement of the dots from different perspectives to determine how to successfully connect them.

12. What strategy did you use to solve the problem?

Once I recognized that I needed to build triangle shapes using the red and grey dots, I became more successful at solving these problems. I started to experiment with creating different sized triangles that were oriented to capture the dots. In addition, on some of the hardest puzzles I made a little grid in my notebook on which I indicated “zones” where the dots could and could not be placed to create a triangle of appropriate size. However, I was unable to complete all of the puzzles.

13. How did you develop this strategy?

I developed my strategies through repeated trial and error situations. I began to keep the “record grid” in my notebook to keep track of the possible combinations and their locations.

14. What declarative knowledge was needed to solve this problem?

This complex task required facts, concepts, and principles. Facts included basic geometric concepts of line segments, shapes, and angles. Conceptual knowledge was needed to recognize that the factual knowledge was being applied to the problem. Finally, knowledge of Principles was needed to understand how the angles/figures would change as the dots were moved.

15. What procedural knowledge was needed to solve this problem?

I feel that this problem required heavy abstract/analogical/symbolic reasoning and cognitive flexibility to solve. It was necessary to have to create mental models and adapt them to a wide variety of situations and perspectives. (Kirkley, p. 8)

Kirkley, J. (2003). *Principles for Teaching Problem Solving: Plato Learning White Paper: Technical Papers #4*. Indiana University: Indiana. - Free to publicly distribute - noted on article.