Kaila Hastings
Dr. Josh Brown
The E in STEM: Meaningful Content for Engineering
SCED 542
September 11, 2020

Online Problem Solving

Teaching problem solving in the classroom is often confused by front loading students with context and purely masquerading problem solving by calling it the scientific method. It is important to teach problem solving in our classroom by fostering the skills required in this complex principle. In doing this assignment, it allowed us to engage in engineering interactives and think about the way we solve problems. I worked through all of the problems that were hyperlinked to this assignment. However, there were four that were of interest to me. They were:

- The Tower of Hanoi
- Three Jugs
- Trio Match
- Wolf, Cabbage, Sheep

Some I enjoyed playing and went on to increase in level. Some were short, concise and easily solved. For this assignment, will meta-cognitavely analyze the Wolf Cabbage,Sheep problem and the Trio Match game.

The problem that I found the easiest to solve was Wolf, Cabbage, Sheep. I found this challenge easy to solve because the expectations were simple and clear. There were very few moves to perform in order to solve this problem. I felt that I have had previous exposure to a similar problem set such as this one. I would consider Wolf, Cabbage, Sheep to be a well structured problem. According to Kirkley, a well structured problem is a problem that always uses the same step-by step solution, has only one right answer, and all the information was present at the beginning of the problem. Thus, this short and concise problem fits the criteria of a well structured problem.

The strategy that I used to solve the problem was to always keep the wolf and the cabbage together. I sailed the sheep with the man over to the opposite riverbank and then let the man go back for the second organism(cabbage). When making the second trip over to the other side of the riverbank, I dropped the cabbage off, however, the man then took the sheep back with him to the starting side of the riverbank. I swapped out the sheep for the wolf and delivered the wolf to the opposite side riverbank that also had the cabbage. Once the wolf was in place, I sent the man to pick up the sheep, bringing the sheep to the opposite side of the riverbank, and then, finally ended the problem. I developed this strategy because both scenarios involved the sheep. It was either the sheep eats or the sheep gets eaten. So, therefore, the sheep became the bargaining chip in the problem solving.

The declarative knowledge that I used was about the feeding relationships between the animals. Facts were provided about what each of the animals consume. The concept of leaving the wolf with the sheep or the sheep with the cabbage would result in an unsuccessful solved problem. The principles of knowing why I was leaving the sheep solitary at each side of the riverbank was so that the other organisms could be moved successfully without a conflict.

I made a mental model of the trips that I was going to make using the man in the boat. I even mapped it out on a piece of paper. One had to infer that once the animal was brought to the opposite side of the riverbank, they could also be brought back. You had to know that your moves were not finite, which allowed the process of juggling these characters to be more efficient.

The problem that I found the most difficult to solve was Trio Match. It wasn't difficult to solve however, there were so many different ways to score points and the highest score would end your game. You had to also look into how you were going to replenish your blocks. You were not given an infinite supply of blocks. I discovered that I often advanced in levels, but was quick to run out of blocks at higher levels due to the removal of different shapes or colors.

Trio match is a moderately structured problem. Trio Match fit this classification because it often had more than one acceptable solution strategy, it had one right answer or else the game ended, and you needed other gathered information.(Kirkley, 2003) I also practiced mental modeling to make predictions about placing shapes in certain spots or combining certain colors. Kirkley states, "Learners must invent a strategy which suits the context." There were no strategies provided in the instructions of the game

In order to achieve level advancement and bonus blocks, I tried to follow all of the rules of the problem such as combining like shapes of different colors or different shapes of different colors. There were many strategies to keep in mind when completing this task. Often, I looked ahead at which blocks were going to be available in the next turn. This allowed me to plan ahead in organizing for potential trios. I also tried to stay away from the same shape and same color. This would end the game. I did develop a strategy by saving an area in the playing field that I could dump blocks that were not going to get me any points but could in the future.

The declarative knowledge that you needed to know was what was going to be different about each block (color and shape). Then you needed to know, as a concept, that the object of the game was to not link three of the same shape and color together or else your game would be over. You also needed to know that you would run out of blocks if you didn't get a trio of blocks that could award you new rounds. The principle of the game was to follow all of the requirements to get awarded points, gain extra blocks and level up. This provided the why behind your strategies.

Making mental models was an extremely helpful procedure. You had to think not only for each individual move but you had to look at how that move would impact your future move. You also had to look at future blocks supplied for the drop rounds. This was the best way to plan on getting your trios. Comparing this game to Tetris in the beginning was very confusing. The only

thing that it had in common with Tetris was dropping blocks. The skills were different and the requirements were opposite.

It was interesting to practice these games and learn how to think about the way I solve problems. I intend on utilizing these strategies in the way I complete my lesson planning and incorporate problem solving in my classroom.

Work cited

Kirkley, J. (2003). Principles for Teaching Problem Solving.PLATO Learning, Inc.