**Learning Journal Unit 4**

**Describe what you did and how you did it.**

In this unit, I focused on understanding and implementing algorithms for solving shortest path problems and finding minimum cost spanning trees. I started by reading the learning guide and the assigned readings to gain a solid understanding of the concepts, particularly Prim's and Kruskal's algorithms.

For the discussion assignment, I wrote a detailed explanation of Kruskal's algorithm, highlighting its greedy nature. I provided examples to illustrate the process of selecting the shortest edges and ensuring no cycles are formed until all vertices are connected.

For the programming assignment, I developed a Java implementation of Prim's algorithm. I used the graph data structure from Unit 2 and implemented the algorithm to find the Minimum Spanning Tree (MST). I tested my implementation using various graphs to ensure accuracy and efficiency. The algorithm outputs the total cost of the MST, which is the sum of the weights of the selected edges.

**Describe your reactions to what you did.**

I found this unit to be both challenging and rewarding. Understanding the greedy nature of Prim's and Kruskal's algorithms required careful consideration of how each step leads to an optimal solution. Implementing Prim's algorithm in Java was particularly satisfying as it solidified my understanding through practical application.

**Describe any feedback you received or any specific interactions you had. Discuss how they were helpful.**

During the discussion assignment, I received feedback from peers who pointed out some areas where my explanation could be clearer. This feedback helped me refine my understanding and improve my ability to articulate the concepts. Additionally, peer assessments of my Unit 3 assignment provided insights into areas I could improve in my code, which was beneficial for my Unit 4 programming task.

**Describe your feelings and attitudes.**

I felt a sense of accomplishment upon successfully implementing Prim's algorithm and understanding Kruskal's algorithm deeply. Initially, I was apprehensive about the complexity of these algorithms, but breaking down each step and applying them practically helped build my confidence.

**Describe what you learned.**

I learned how to implement and apply Prim's and Kruskal's algorithms to solve shortest path problems and find minimum cost spanning trees. I also gained a deeper understanding of greedy algorithms and their characteristics. Through the programming assignment, I improved my coding skills in Java, particularly in working with graph data structures.

**What surprised me or caused me to wonder?**

I was surprised by how elegant and efficient greedy algorithms can be in solving complex problems like finding MSTs. The simplicity of selecting the shortest edge while ensuring no cycles are formed in Kruskal's algorithm was particularly intriguing.

**What happened that felt particularly challenging? Why was it challenging to me?**

Implementing Prim's algorithm was challenging because it required careful management of the priority queue to select the shortest edges efficiently. Ensuring the algorithm correctly updates the minimum edge weights and maintains the MST without cycles required meticulous attention to detail.

**What skills and knowledge do I recognize that I am gaining?**

I am gaining a stronger grasp of graph theory, specifically in understanding and implementing algorithms for MSTs. My programming skills in Java are also improving, especially in handling complex data structures and algorithm implementation.

**What am I realizing about myself as a learner?**

I am realizing that breaking down complex problems into smaller, manageable steps significantly enhances my understanding and ability to implement solutions. I am also recognizing the importance of peer feedback in refining my work and deepening my comprehension.

**In what ways am I able to apply the ideas and concepts gained to my own experience?**

The concepts and skills gained in this unit are directly applicable to real-world problems involving network design, such as optimizing routes and minimizing costs. Understanding greedy algorithms also provides a foundation for tackling other optimization problems in computer science and beyond.