Final Project Guide

In this guide, we will take you step-by-step through a sample final project. There will be four components to this guide, which align with the four components of the final project:

1. A paragraph describing any background information or context for the problem.
2. A completed graphic organizer that includes problem identification, decomposition, pattern recognition, and abstraction.
3. A project justification describing how the computational thinking process was used in your graphic organizer.
4. A visual representation of the algorithm.

For each component, there will be explanatory text detailing the thought process for a sample final project. Please use this guide to inform your decision making in your final project.

Note: There are many ways to complete this final project, and you should complete the project in a way that aligns with your own computational thinking process.

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Background and Context Paragraph

For my final project, I am assuming the role of a high school administrator, and I have to decide whether or not I should cancel school in preparation for a snow storm. I live in a rural part of Michigan, and my town regularly receives heavy snow falls. While many of us get our roads plowed before school starts, there are some roads that remain unplowed throughout the day. When these roads don't get plowed, it makes it very dangerous for school buses to pick up children on their way to school.

This paragraph serves as an introduction to the final project. It's meant to give readers an overall understanding of the problem. This paragraph does not go into the specific stages of decomposition, abstraction, and pattern recognition. This information will be provided later in the project.

Graphic Organizer Iteration 1

Problem Identification

I am a high school administrator in Michigan, and I just learned that a major snow storm is coming to Michigan. If there is too much snow on the road, this can be a major hazard for the buses that take children into school in the morning. What actions should I take to prepare for this snow storm?

The problem identified is broad, and it needs to be decomposed further.

Decomposition (How would you break down your problem into sub-problems?)

To make a decision, I should know:
- How much snow is expected
- When will the roads be cleared of snow

The decomposition process begins to narrow in on specific questions. In particular, it focuses on how much snow is expected, and when the roads will be cleared of snow. These sub-problems are helpful for solving the larger problem, and they are specific and quantifiable.

Pattern Recognition (Are there related solutions to draw on?)

Based on previous snow storms, schools have either canceled school, delayed the school's start time, or started school as usual. To follow this precedent, I should choose between one of these three outcomes.

The pattern recognition is based on previous cases of snow storms. It's helpful because it gives three possible outcomes: cancel school, delay the school's start time, or start school on time.

Graphic Organizer Iteration 2

Problem Identification

School starts at 8am, and a major snow storm is going to hit Southeast Michigan at 9pm the night before school. Local weather channels are anticipating a snowfall of about 6 inches. According to weather reports, major roads will be cleared of snow by 6am. The less traveled rural roads, however, won't be cleared until 8am, which is the time school starts. Should I cancel school? Delay the school's start time, or have school start as usual?

The identified problem is more specific compared to iteration 1. Importantly, it identifies three specific outcomes: either cancel school, delay the school's start time, or have school start as usual. These outcomes were derived from the pattern recognition phase in iteration 1.

Abstraction (How would you abstract this problem?)

Knowing what time the roads will be plowed, and how much snow will fall are important for me to consider.

This abstraction phase recognizes that WHEN roads will be plowed is important for the identified problem.

Decomposition (How would you break down your problem into sub-problems?)

Now that I know some rural roads will NOT be cleared before the school's start time, sub-problems I still need to solved are:
- Do any school children live on the unplowed roads?
- Can buses safely drive through 6 inches of snow?

This decomposition phase identifies more sub-problems. Note that they are objective yes or no questions.

Graphic Organizer Iteration 3

Problem Identification

School starts at 8am, and a major snow storm is going to hit Southeast Michigan at 9pm the night before school. Local weather channels are anticipating a snowfall of about 6 inches. According to weather reports, major roads will be cleared of snow by 6am. The less traveled rural roads, however, won't be cleared until 8am, which is the time school starts. Should I cancel school? Delay the school's start time, or have school start as usual?

This problem identification is the same as iteration 2. While this problem could be narrowed even further, for the scope of the algorithm being built, it isn't necessary.

Decomposition (How would you break down your problem into sub-problems?)

In addition to snowfall, I also need to consider the amount of ice that will be on the roads, since that will be a major hazard for school buses.

This decomposition identifies one final sub-problem: the amount of ice on the roads.

Abstraction (How would you abstract this problem?)

Knowing the amount of ice on the roads is important information. I should also take into account when the ice will be cleared off the roads.

This abstraction phase acknowledges that knowing whether or not ice is on the road is important.

Project Justification

Pattern Recognition. For each iteration where you recognized patterns in data, please explain how these patterns helped you solve your identified problem.

For this project, I utilized the pattern recognition phase in Iteration 1. This was an important phase because it allowed me to identify three potential outcomes: either cancel school, delay the start time, or have school run as usual. Once I identified these three potential outcomes, the rest of the work was deciding how to choose the appropriate outcome.

Abstraction. For each iteration where you abstracted information, please explain how abstraction allowed you to solve your identified problem.

The abstraction phases were used in Iterations 2 and 3. In Iteration 2, the abstraction phase recognizes that what time the roads will be plowed is an important variable to consider. In Iteration 3, the abstraction phase recognizes that ice on the roads is an important variable to consider for the identified problem. These abstractions helped solve my identified problem because it allowed me to focus on relevant information, while ignoring less important information.

Problem Identification. For each iteration of your problem, please explain how you arrived at your identified problem.

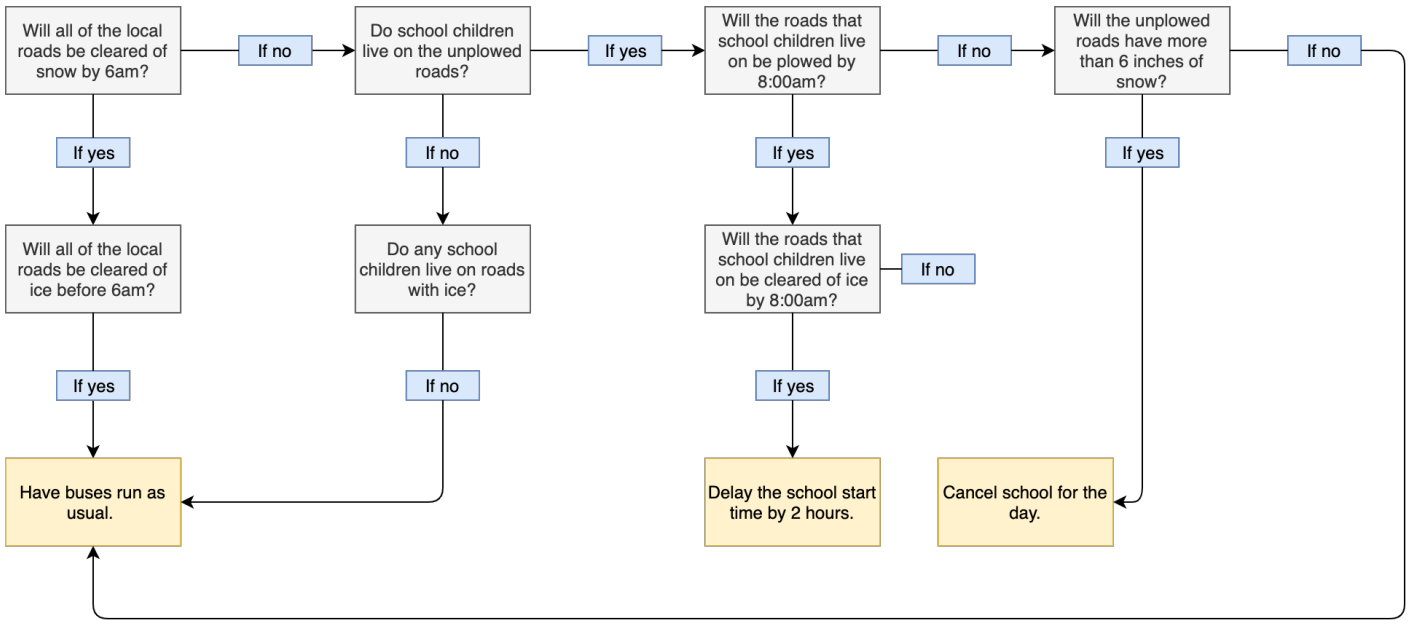
For Iteration 1, I began with a rather broad question, which essentially asked: "What actions should I take?" For Iteration 2 and 3, I provided more information for my problem, and I came up with three potential outcomes: either cancel school, delay the school's start time, or start school as usual. These three outcomes were derived from my Iteration 1 pattern recognition phase.

Decomposition. For each iteration where you decomposed an identified problem, please explain how this decomposition helped you solve your identified problem.

The decomposition phases were important for me in all three iterations. In Iteration 1, I identified two sub-problems that helped solve the larger problem. In Iteration 2, I identified two more sub-problems. In Iteration 3, I identified one last sub-problem. Together, all of these sub-problems were helpful because they focused in on specific aspects of my larger problem, and they all asked questions that were quantifiable.

For the project justification document, the primary goal is to justify and explain your computational thinking process. For each section: Problem Identification, Decomposition, Pattern Recognition, and Abstraction, you should address how these computational thinking processes were used in each iteration of your graphic organizer.

Algorithm Depiction



This algorithm depiction shows the thought process a high school administrator could go through when preparing for a snow storm. Notice how ideas generated from the computational thinking graphic organizer are used in the algorithm. These ideas include: accounting for snow and ice on the road, accounting for when the roads will be cleared, and accounting for where the school children live.

It should be noted that this algorithm is not necessarily finalized, and it is not the only way to represent this information. The computational thinking process is highly complex and iterative, and there is often more than one way to solve a problem. To improve on this algorithm, we could account for things like temperature, wind chill, road visibility, and the working conditions of the busses.