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Design Process Exercise

First of all, this sounds like a fascinating project, but it has a lot of different components. Initially, the problem needs to be broken down into smaller pieces, or subsystems that can be addressed individually. Some potential subsystems for this project could include excavation, mass storage, navigation, control, communications, and delivery. All of these subsystems need to work harmoniously for the completed robot to function appropriately and meet the design requirements.

If this assignment is done in a group, each subsystem would be assigned to one person. Considering how many different disciplines are involved in creating the robot, one of the biggest hurdles in devising a solution would be the amount of research involved. To build the robot, we would need to know what materials we would need to use, our budget, the stakeholders' priorities, and any other design constraints that are not specified in the problem statement. In addition to individual research, we would need to consult with experts in several fields such as materials, manufacturing, wireless communications, mining, and ideally NASA themselves.

We will need to know what kind of materials we would be mining and their properties so that we would be able to extract and store them successfully. The final product would need to be robust enough to survive in a challenging and remote environment. Our robot would need to withstand extreme temperatures and be resistant to dust. To top it all off, the robot would need to operate without human

intervention for the duration of its lifetime, making the design constraints of all the components that much more extreme.

In terms of basic functionality, the robot would need to be able to locate the spot where it should dig, drill into the surface, extract the ice stimulant, store the ice simulant securely, carry it to a collection location, deposit the specimen into the collection bin, and repeat as many times as needed. Each of these tasks is complex and would require a lot of research and prototyping to make sure the subsystems work as well as possible while being as cost-effective as possible. Lots of research would need to be done to ensure that all the components are resistant to the elements and would survive in such a harsh environment.

Provided we have the resources and the time; we would need to stress test all of our components to see how long they would last. In summary, the problem would need to be broken down into as many constituent subsystems as possible, and each of those subsystems would be assigned to an individual or a group of individuals to complete. Once each subsystem functions as desired, the whole team would assemble the final robot, and more advanced testing would begin once the working prototype is complete. After building the first unit, we can further improve our design and fully explore any potential issues with our solution as time allows. Successfully completing this project would require lots of organization and communication between the people working on it.