

Supplemental Material 1. Problem statements provided to the students

Low-Skill Snow Transporter Problem

Today skis and snowboards are widely used as personal transportation tools on snow. But to be able to use them, a lot of skill and experience are required that a user cannot normally learn within one day. Moreover, skis and snowboards cannot run uphill easily. It would be better if there were other options of personal tools for transportation on snow, which still allowed the user to control direction and braking, but did not require much time to learn how to use.

Design a way for individuals without lots of skill and experience skiing or snowboarding to transport themselves on snow.

Develop solutions for this problem and select a final solution at the end. **You can take as long as you need but spend a minimum of 1 hour to complete this task.** If you need any resources, please let me know.

One-Hand Opener for Lidded Food Containers Problem

The local rehabilitation center helps to treat thousands of stroke patients each year. Many individuals who have had a stroke are unable to perform bilateral tasks, meaning they have limited or no use of one upper extremity (arm/shoulder). A common issue the hospital has observed with their stroke patients is in their ability to open jars and other lidded food containers. The ability to open lidded food containers is particularly important for patients who are living on their own, in which case they often don't have help around for even basic tasks. A solution to helping them open lidded food containers with one hand would go a long way in helping the patients to maintain their independence.

Design a way for individuals who have limited or no use of one upper extremity to open a lidded food container with one hand.

Develop solutions for this problem and select a final solution at the end. **You can take as long as you need but spend a minimum of 1 hour to complete this task.** If you need any resources, please let me know.

Supplemental Material 2. Interview Protocol

Overview question

- Can you walk me through how you developed solutions and selected a final one at the end?
 - Use their words in probing!

Idea Generation

That was a great high-level overview. I would like to know the details and specifics about your process.

- How did you generate ideas to address the problem?
- What would have helped you in generating ideas?
- What did you do after generating ideas?
 - Probe using their words

Idea Development

- How, if at all, did you iterate on any of your ideas?
 - How, if at all, did your ideas change from the first time you thought about it until you considered them as final possible solutions?
 - What did you do after iterating?
- How, if at all, did you combine multiple ideas to create a new idea?
- How, if at all, did you organize your ideas?

Idea Selection

- How, if at all, did you evaluate your ideas?
- What criteria did you use to narrow down your ideas?
 - Can you give me examples of some ideas you discarded?
 - Why did you discard these ideas?
- Can you tell me about how you selected your final idea?
 - Why did you select this idea?
- Which ideas influenced your final choice?
- What would have helped you in selecting your ideas?

Reflection

- In summary, what did you do well?
- What could you have done better?
- Overall, what would have helped you to do better with this design task?
- Was this a typical process in coming up with ideas and selecting an idea at the end?

Definitions

- Where did you learn about concept generation, development and selection?
- In summary, what is idea generation in your own words?
 - What strategies are you familiar with in generating ideas?

- What strategies did you use?
- What does success look like in idea generation?
- What does it mean to be unsuccessful in idea generation?
- How successful were you in your idea generation?
- What is idea development in your own words?
- *If they ask what is idea development, respond with - between generating ideas and selecting, let's call that development.
 - What strategies are you familiar with in developing ideas?
 - What strategies did you use?
- What does success look like in idea development?
- What does it mean to be unsuccessful in idea development?
- How successful were you in your idea development?
- What is idea selection in your own words?
 - What strategies are you familiar with in selecting ideas?
 - What strategies did you use in selecting ideas?
- What does success look like in idea selection?
- What does it mean to be unsuccessful in idea selection?
- How successful were you in your idea selection?

End

- Is there anything else that you would like to share to get a better picture of how you approached this design task?
- The post-task interview questions
- Thank you for your time.

For post-task only

- What, if at all, were some things you learned from the idea generation block?
 - What best practices did you think the block was emphasizing the most?
 - What impact, if any, do you think that this block will have on how you generate ideas in the future?
 - How applicable was this material to your future work in engineering courses, co-curricular activities and career?
- What, if at all, were some things you learned from the concept development block?
 - What best practices did you think the block was emphasizing the most?
 - What impact, if any, do you think that this block will have on how you develop ideas in the future?
 - How applicable was this material to your future work in engineering courses, co-curricular activities and career?
- What, if at all, were some things you learned from the concept selection block?
 - What best practices did you think the block was emphasizing the most?
 - What impact, if any, do you think that this block will have on how you select ideas in the future?

- How applicable was this material to your future work in engineering courses, co-curricular activities and career?
- How, if at all, did the coaching session affect the way you generate, develop and select ideas?
- If you could change anything about these learning blocks, what would it be?
- Is there anything else you would like to share about the learning blocks?