ENGINEERING | McMaster University

ENG1P13 Design Communication Workshop #5
Students' Handout

This workshop is to support your P4 reflection assignment. The activities in this handout are intended to be completed by the end of the workshop 5. However, students are encouraged to apply what they learn in this workshop to their studies. The aim is to build a lifelong habit of critical reflection.

Objectives

By the end of this workshop, students should be able to:

- Define the concept of critical reflection
- Explain the importance of critical reflection
- Describe the 3-stage model of reflection
- Write a critical reflection on design thinking focusing on project 4 experience

Summary of Activities and Lab Schedule

Workshop Introduction (5 min)
Introduction to Reflection, reflection model, "What"? (15 min)
Introduction to activity 1 (5 min)
Activity 1 (20 min)
So what? And intro to activity 2 (10 min)
Activity 2 (20 min)
No what? And introduction to activity 3 (10 min)
Activity 3 (20 min)
One-on-one meeting with IAI/TAs (30 min)
Final Q/A and submissions (10 min): Following the lead of your TA or IAI, complete this handout during the workshop. At the end of the workshop, submit the handout as a single pdf file on Avenue to Learn. You are not required to write a formal reflection essay. This is an individual submission.
Upload your reflection essay as a **PDF** to the *Avenue Dropbox* titled **P4 Reflection** using the **MacID_P4_Reflection.pdf** as naming convention.
Your assignment is due at 23:59 EST the day of your scheduled lab. For example, if the lab is Monday at 08:30 EST, the assignment is due at 23:59 EST on Monday.

Grading of Reflection

Your reflection assignment is worth 0.5 mark of your total Project-4 grade (6.25%). Rubric is provided on Avenue to Learn.

If you need to review the content, go to the online reflection module. Here is the link: https://ecampusontario.pressbooks.pub/engineeringreflectiontoolkit/

Introduction

Through reflection, you will be guided to explore an experience of working on a team during your project 4 focusing in design process. To accomplish this task, you will be asked to identify, question, and assess your understanding of what happened. In this way, you make meaning of your experiences through this process of reconciling what you expected would happen with what occurred. Reflection is not a reading assignment, a summary of an activity, or an emotional outlet. Rather, reflection is a way for you to achieve a sense of deeper understanding of what you have learned.
In this workshop you learn how to do this, and you will practice it by reflecting on your Project 4 experience.

Reflection Activities

Consider your experience with the design process as a first-year engineering student working on Project 4 over the past couple of months in ENG 1P13. After exploring the client's challenges and gaining insights, your team decided to focus on one area to improve our client's daily life. You have defined the problem in a problem statement that included objectives, constraints, etc. Through this exploration, you performed a functional analysis that was used to come up with different alternative ways to solve the problem. Your team needed to make a decision between the different alternatives, and you tested your ideas for feasibility. You have been encouraged to iterate as you gained deeper insight and developed empathy for the client. Through the process of iteration, you have had the opportunity to improve upon your ideas. Engineers are continually iterating through the design process. Informed designers are involved in continual learning: learning by doing, learning from brainstorming and prototyping, learning by iteration and from feedback and failure, learning by noticing and troubleshooting, learning by drawing and dialoging about ideas, materials, and people. While iteration is an informal form of reflection, you will deepen your understanding of what you have learned through formal reflection. All of these emphasize the metacognitive and reflective practice aspects of learning through design (Lawson & Dorst, 2009; Crismond & Adams, 2012).

Part 1: What?

In this section you will describe a critical incident that you will be reflecting on as related to the "Generating/Testing ideas" and "Decision-making." For each of these steps of the design process:
In three to five sentences, identify and describe ONE critical incident, breakthrough or big thought-provoking moment that either challenged your assumptions, had a positive impact on you or validated your understanding of the design process.

Here are some questions to consider:
Generating & Testing Ideas:

- How did you go about exploring ideas?
- How deeply did you explore your design options?
  - How much research?
  - Did you look into Biomimicry tools?
  - Did you consider any "What if?" questions in your explorations?
- Did you test your ideas?
- If yes, how did you test your ideas?
  - What were you trying to test (e.g., desirability, feasibility, etc.)?
  - What tool/ method did you use? (physical prototype, CAD model, etc.)
  - How much time did you spend on testing each idea?
  - How many ideas did you test?
  - How many prototypes did you make for testing each idea?
  - Did you test your ideas early on or waited until you had more details of the ideas?
- What was one challenge that you faced in the testing process of the design? (we encourage you to write more than one challenge). And What did you do to solve that challenge? (you can attach photos to explain your attempted solutions)
- From the results of our testing, one change we made to improve our design solution was … (add your response) and this change made our design solution better because … (add your response).

Your response:

Exploring Ideas:

- We started by generating different ideas to see whether we could meet our client's need for wheelchair cover.
- We investigated several wheelchairs covers that were already on the market, rain-resistant fabrics, and control mechanisms to fully explore our design alternatives.
- We considered design concepts influenced by nature, such as how some plants shed water or how animals adjust to rain, even though we didn't explicitly use biomimicry techniques.

- To push the limits of conventional thinking and think of creative solutions, "what if?" questions were essential to our investigations.

Ideas of Testing:

Yes, we put our ideas to the test to determine their viability, functionality, and desirability. To test our concepts, we mostly employed actual prototypes that let us interact with the designs in a practical way. Several attempts of testing spent testing each proposal, depending on how intricate it was. We experimented with several possibilities, building prototypes for each to get input and improve our ideas, and we also tested how compatible it is with harsh weather, like rain, wind, etc. Early in the design phase, testing allowed us to spot any problems and make necessary revisions to our concepts.

Challenges faced:

Making sure the wheelchair cover was stable and durable especially in harsh weather was one of the challenges we faced during the testing process.
We experimented with various materials and reinforcing methods to overcome this difficulty, and we put our designs through rigorous durability testing to determine their strength and resilience.

Improving the Design Solution:

We improved our design solution by adding more securing mechanisms to increase stability and longevity, because of the testing findings.
This modification improved our design solution by giving the user more security and assurance that the cover would stay in place even in windy or rainy situations.

Decision Making:

- What happened during decision-making?
  - Where in the process, relative to the design process steps, did you make decisions?
  - What were the decisions about? Decisions could be about the process (e.g., how much searching of the design space was enough?) or about the design (e.g., which alternative to prototype).
  - How many options did you have to choose from?
  - How many criteria did you have to compare the options? How did you choose those criteria?
  - What tools did you use to make a decision?
- At what stage did you make a decision?
- When did this experience take place? Did you already have one final solution in mind or you were still exploring the ideas?
- What challenges did you face during decision-making process?

Your response:

From this project I learned how important it is to test ideas early in the design phase. Testing early helped us find problems and make our design process smoother. I also realized that delaying decisions can sometimes hold us back from exploring other options or solving problems quickly.

These lessons are important because they show how vital it is to do lots of testing and make decisions early in the design process. In future projects, I'll approach them with a more strategic mindset. By understanding the value of early testing and proactive decision-making, I can create better user experiences and achieve more successful outcomes.

Part 2: "So What?"

In this section you will explore what you learned and describe why this incident matters to you.

In three to five sentences, discuss what you learned from this incident about idea generation, testing ideas, and decision making and that either surprised you, made you confront a misconception, or improved your understanding of the design process.
To help you think about this, consider the following:

- What was the outcome of early or late testing processes?
- Do you think delaying any of your decision-making may have improved the design?
- Could you have collected better observations or data that would have led to better decisions?
- Did you repeat your decision-making process at any other stage?

Your response:

I found out that testing designs early and making decisions ahead of time are super important for making good designs. This matters because it helps me create designs that really focus on what users need and work well. In the future, I'll prioritize testing early and fixing problems fast to improve my designs quicker. But there might be challenges with managing time and resources. Still, making great designs in the long run is worth it, even if there are some bumps along the way.

In two to three sentences, explain why these new insights are important to you.

Your response:

My understanding of good design processes has improved because of these new insights, which highlight the importance of early testing and quick decision-making. These guidelines will help me make sure that my projects in the future are more effective, user-focused, and ultimately successful. I can now confidently tackle design difficulties and provide meaningful solutions that satisfy user demands because of this insight.

Part 3: "Now What?"

In two to three sentences, discuss how you will integrate this new insight into future design projects. To help you think about this, consider the following:

- I learned that... (Express and important learning, not a statement of fact)
- This learning matters because... (Consider how this learning has value to you as an engineer)
- How will I apply my learning?
- How will I design differently next time?
- How will I deal with a similar situation in the future?
- Considering this learning, I will... (Set specific, assessable goals; consider benefits and challenges involved in this plan)

Your response:

The experience that I gained from this project is the significance of early testing in the design phase. Early idea testing helped us spot possible problems and improve the efficiency of our design iterations. I also came to the realization that delays in making decisions can occasionally limit our ability to go forward by preventing us from looking into other options or quickly dealing with issues.

I find these observations to be significant because they emphasize how crucial it is to do plenty of testing and make decisions early in the design process. I may approach future design projects with a more strategic mentality and eventually produce better user experiences and more successful outcomes by knowing the value of early testing and proactive decision-making.

In two to three sentences, describe the possible benefits and challenges involved in your plan.

Your response:

Effective time and resource management is necessary to carry out exhaustive testing and reach choices quickly. Potential stakeholder disagreements about decision-making procedures and project schedules may also provide challenges. Applying this new understanding to design projects in the future will require striking a balance between these factors.

References:

Lawson, B., & Dorst, K. (2009). Design expertise. Oxford, UK: Architectural Press.

Crismond, D. P., & Adams, R. S. (2012). The informed design teaching and learning matrix. Journal of Engineering Education, 101 (4), 738-797.

[1]
A. Watt, "Resource Planning – Project Management," *Opentextbc.ca*, Aug. 15, 2019. https://opentextbc.ca/projectmanagement/chapter/chapter-11-resource-planning-project-management/

[2]
"What is Early Testing and Why to Start Testing Early in SDLC (Practical)," *www.softwaretestinghelp.com*. https://www.softwaretestinghelp.com/early-testing/

[3]
Project 4 in the content of 1P13.

PROJECT FOUR **REFLECTION – INDIVIDUAL** RUBRIC

Criteria	1 Below Expectation	2 Marginal	3 Meets Expectation	4 Exceeds Expectation
Communication	Many punctuation, grammar, and capitalization errors.	Noticeable punctuation, grammar, and capitalization errors.	Professionally written with minimal errors.	Professionally written with no errors. Good flow of ideas and concise when necessary.
Content – What?	Missing 3 or more items from Level 3.	Missing 1 or 2 items from Level 3.	• Written in first person. • Clear description of context. i.e., history, environment, and/or key participants - who, what, when, where, how, why? • Draws from most senses to describe the incident, experience, problem, situation. • Offers concrete examples and illustrations to clarify and enhance knowledge claims and understanding. • Uses some judgment, interpretation, and/or personal bias in explanations. • Identifies some initial thoughts or feelings experienced during the described event • Provides definitions of technical terms and key concepts.	
Content – So What?	Missing 3 or more items from Level 3.	Missing 1 or 2 items from Level 3.	• Identifies successes or positive aspects of the experience. • Identifies challenges that were experienced. • Identifies why the experience they chose to highlight was important to their learning. • Identifies how their knowledge or perspective has changed as a result of the experience.	
Content – Now What?	Missing all items from Level 3.	Missing 1 or 2 items from Level 3.	• Explicitly mentions something that they learned during the experience. • Explains why their new learnings are important. • Outlines how they might use their new learnings in the future.	

List of Penalties	Deduction
Missing Name or MacID	**–10%**
Late Penalty	**–20% per day**

PROJECT FOUR MILESTONE THREE: PROTOTYPING, DECISION MAKING AND DESIGN REVIEW #2

MILESTONE 3.1 – REFINED CONCEPT: INITIAL PROTOTYPE

Team ID: THURS-16

Complete this worksheet individually before coming to Design Studio/Lab A for Week 8.

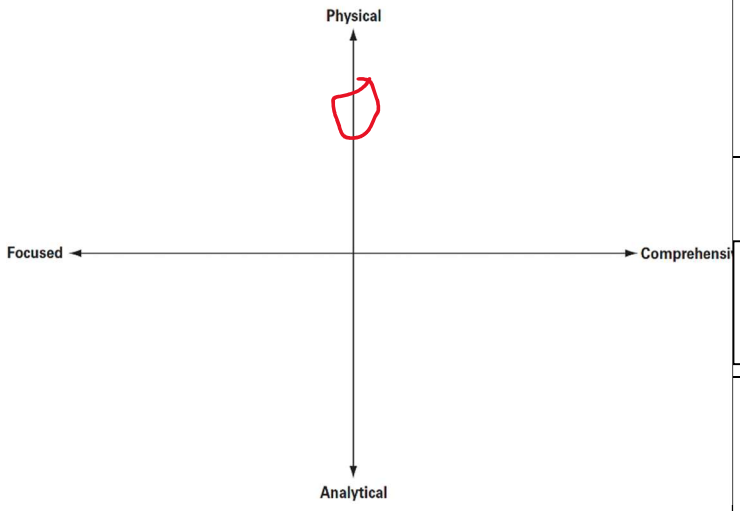
1. Write a small description of your initial prototype. Be sure to include what problem it aims to solve, how your initial prototype will be fabricated, and what functionality will be included and omitted in this initial prototype.
2. Classify whether your prototype is Physical or Analytical, and Focused or Comprehensive. Include the purpose of this prototype in the context of project 4 and the level of fidelity (low, medium, or high fidelity)
   - → **Physical vs. Analytical:** Physical prototypes are tangible artifacts that are created to approximate the final product. Analytical prototypes are non-tangible and represent the product using usually visual or mathematical models.
   - → **Focused vs. Comprehensive:** Focused prototypes implement only one or a few of the attributes of the final product. Comprehensive prototypes aim to implement most, if not all of the attributes of the final product.
3. Create a list of objectives and metrics for your initial prototype. There is no required amount of objectives or metrics, so long as the list is comprehensive.
4. Create a rough experimental plan for how you might test your prototype. Consider the methods you might use to test various objectives, how you will measure how effective each test proves to be and how realistic it would be to implement. This does not need to be detailed plan but should consider several of your objectives for the prototype.
5. Take picture(s) of your refined concept (initial prototype)
   - → Insert your photo(s) as a Picture (Insert > Picture > This Device)
   - → **Do not include more than *two* refined concept pictures per page**
   - → Include details on how concept was refined (what feedback was incorporated, what features are different than previous concept exploration, etc.)
   - → You can continue this process within the allocated time of the LabA/DS and seek feedback and discussions from your team members and/or the instructional team (IAIs, TAs, etc.).

Name: LUAY ALABED ALKADER	MacID: ALABEDAL

Write a short description of your initial prototype below.

My prototype is a plastic cover designed to be installed on the top of a wheelchair, serving as a protective canopy for the wheelchair passenger against rain and other elements.

Indicate where your prototype falls on the scale below.



Kind of Prototype:

☑ Physical or ☐ Analytical

☐ Focussed or ☐ Comprehensive

Purpose of Prototype:

Protect the client from the rain and the harsh weather.

Level of Fidelity:

Medium as the design is easy to make

Include a list of objectives and metrics for your prototype below.

Objectives	Metrics
• **Protect from rain.**	• **kg**
• **Light weight**	• **Dollar**
• **Easy to install.**	• **size**
• **Easy to mount.**	• **strength**
• **Easy to use**	• **durability**

Insert picture(s) of your refined concept (initial prototype) below.

PROJECT FOUR MILESTONE TWO: DESIGN EXPLORATION AND DESIGN REVIEW #1

MILESTONE 2.1 – CLIENT NOTES

Team ID: THURS-16

Complete this worksheet individually before coming to Lab A for Week 7.

Include your client notes from the introductory client visit.

Name: LUAY ALABED ALKADER	MacID: ALABEDAL

Personal Information:

Name: Tiffany
Age: 33
Diagnosis: Spina Bifida
Mobility & Assistance:

Uses a power wheelchair for primary mobility.
Requires assistance from a nurse and PSW for daily activities.
Occupation:

Employee at Walmart, responsible for stocking shelves and assisting customers.
Challenges:

Limited mobility in the lower half of the body.
Needs assistance with everyday tasks.
Difficulty navigating inaccessible doors and uneven surfaces.
Difficulty reaching high shelves at work.
Experiences cold sensitivity due to back implants.
Goals:

Increase independence in daily activities.
Improve accessibility and safety measures related to wheelchair use.
Find solutions for reaching high shelves at work.
Address cold sensitivity, particularly during winter months.

MILESTONE 2.2 – RESEARCH ASSIGNMENT

Team ID: THURS-16

Complete this worksheet before Lab A for Week 7.

- State the question you plan to answer through your research
- Summarize your research findings (answer). Your answer should be a coherent, well-written summary of your research, not a "brain dump".
- You may include images, but don't forget to cite them properly.
- Aim for a length of about 500 words
- Properly cite your sources using IEEE formatted references and in-text citations. For information on referencing formats and choosing sources, see Design and Communication Workshop 1.

Name:	MacID:
What is your question? How are we going to use metal frame for the wheelchair cover?	
What is your answer? The use of a metal frame enhances the wheelchair cover's longevity and structural soundness. With well-selected materials like sturdy steel or thin aluminum, the frame provides robust support without gaining unnecessary weight. The wheelchair's dimensions are carefully considered at every stage of the frame's construction and welding, ensuring a secure fit and optimal functionality. Users may easily connect the cover to the frame thanks to its strategically placed attachment points, which also offer solid weather protection. The wheelchair cover is made of a well-thought-out aluminum construction that ensures it will survive everyday usage and provide comfort and peace of mind to its user, whether they use it for inside or outdoor activities.	
List of sources: [1] "Rigid Frame Wheelchairs; Turning Energy into Motion | Education in Motion Blog," *Sunrise Medical*. https://www.sunrisemedical.com/education-in-motion/blog/july-2021/rigid-frame-wheelchairs-turning-energy-into-motion	

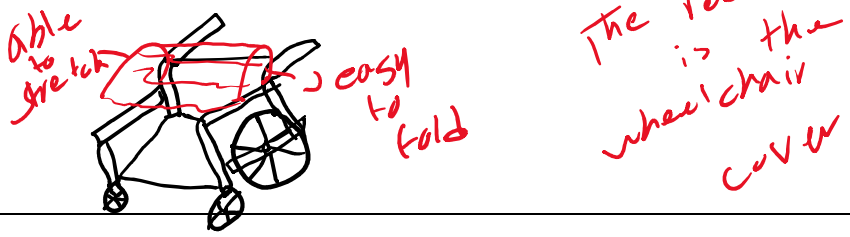
[2]
"Rigid Frame Wheelchairs; Turning Energy into Motion | Education in Motion Blog," *Sunrise Medical*. https://www.sunrisemedical.com/education-in-motion/blog/july-2021/rigid-frame-wheelchairs-turning-energy-into-motion

MILESTONE 2.2 – INITIAL CONCEPT EXPLORATION

Team ID:	THURS-16

Complete this worksheet before Lab A for Week 7.

1. Include multiple images of your **initial** concept exploration, if needed
   - → Include necessary annotations to help in
   - → the communication of your ideas
   - → These can be photos of hand sketches, photos of initial prototypes, screen grabs of basic CAD models
   - → Include your Team Number, Name and MacID on *each* concept image
2. Insert your photo(s) as a Picture (Insert > Picture > This Device)
3. **Do not include more than *two* concept images per page**

Name: luay Alabed alkader	MacID: alabedal98
Team number: Thurs-16 	

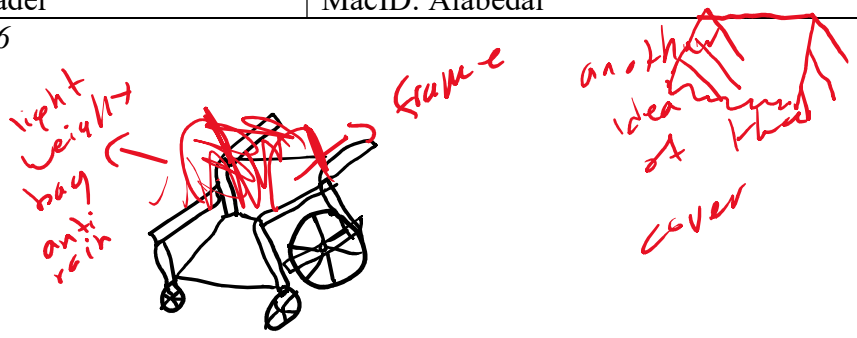
MILESTONE 2.4 – REFINED CONCEPT EXPLORATION

Team ID: THURS-16

Complete this worksheet during Lab A for Week 7.

4. Include multiple images of your **refined** concept exploration, if needed
   - → Include 2 distinct concepts based on the functional analysis
   - → Include necessary annotations to help in the communication of your ideas
   - → These can be photos of hand sketches, photos of initial prototypes, screen grabs of basic CAD models
   - → Include your Team Number, Name and MacID on *each* concept image
5. Insert your photo(s) as a Picture (Insert > Picture > This Device)
6. **Do not include more than *two* concept images per page**

Concept 1:

Name: luay Alabed alkader	MacID: Alabedal
Team number: Thurs-16 \\\ 	

Team ID: THURS-16

Concept 2:

Name: LUAY ALABED ALKADER	MacID: ALABEDAL

Insert screenshot(s) of your concept below.