**Students’ Hand out**

The activities in this handout are intended to be completed by the end of the workshop. 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 Schedule for a 3-hour Class

**Workshop Introduction (5 min)**

**Introduction to Reflection, reflection model, “What”? (15 min)**

**Introduction to activity 1 (5 min)**

**Activity 1 (20 min)**

**Break**

**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)**

**Getting feedback from TAs (30 min)**

**Final Q/A and submissions (10 min):**

**Note**: 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 design project. 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 over the past couple of months. 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:

**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:

## 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:

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

Your response:

## 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:

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

Your response:

## 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.

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. |  |