

Essay Evaluation Rubric

November 16, 2023

The workshop course is provided by technology-oriented engineering department. The goal is to understand technologies but also to foster motivation and active involvement of groupwork. The assignment given to the students was as follows:

1. Kinematic Synthesis of Mechanisms <Train Gap Filler>

The gap between the train and the platform at train stations is a significant safety hazard, often leading to accidents. This risk is especially high for children, the elderly, and individuals with physical disabilities with wheelchairs. The challenge is to devise a mechanism that effectively mitigates this danger.

2. Kinematic Synthesis of Mechanisms <Say “NO” to Door Knobs>

This project develops a new mechanism for touchless doors, inspired by the widespread unease with touching door handles in public spaces like schools, hospitals, and restrooms during the Covid-19 pandemic. This design aims to eliminate the need for physical contact with door knobs.

3. Net Zero X <Carbon Dioxide Removal>

Given that emissions of CO₂ are produced by all sectors of society, identifying effective ways to capture CO₂ and store it safely is crucial. Create methods to extract CO₂ from the air and separate it into its constituent elements, carbon and oxygen, and explore how these elements can be repurposed effectively.

4. Net Zero X <All Electric Airplane>

The objective of this project is to develop a strategy for reducing CO₂ emissions from airplanes. It involves researching the current challenges faced by the airline industry regarding CO₂ emissions and conceptualizing an all-electric airplane as a viable solution to significantly lower these emissions.

5. Radioactive <Science Communication on High-Level Radioactive Waste>

High-level radioactive waste (HLW) is created by the reprocessing of spent nuclear fuel. Storage cannot provide the permanent isolation of the wastes from human's environment. This workshop aims to reveal the current conditions and possible disposal methods of HLW, and understand ways of dealing with real social issues.

6. Monster Track <Damages on Infrastructures by Oversized Vehicles>

The oversized loading induced an excessive external load which exceeds load-carrying capacity of bridges, resulted in collapse incidents. Clarify the common challenges in protection of infrastructures during their life cycle from oversized vehicles and come up with initiatives and solutions to this issue.

Around six students formed groups and challenged one of the above six problems in seven 3-hour workshops: ideation, interim report, prototyping, final report, and a reflection essay at the end. Each student is requested to create an individual reflection essay including the following descriptions.

- Project description (300-400 words)

Title, goal and conclusion of the project

Process of the project: how you applied design thinking methods

- Contribution (300-400 words)

Your role in the project

Your contribution to the project

- Reflection (200-300 words)

Write freely but we are interested in what you learned from the series of workshops not only professional knowledge and skills but also how to contribute to and facilitate the workshops

Here is a student essay to be evaluated.

[STUDENT ESSAY]

After much discussion we had decided to improve and add on a platform of some sort, more specifically to cover the gap that is found between the train itself and the train platform. If we were to cover the gap, we will reduce the risk of accidents regarding the gap such as belongings falling down as well as your foot getting stuck or someone falling onto the platform due to the gap. Our goal is to create a gap that will make it more convenient and safer for people, more specifically, disabled people, to get on and off the trains. Working as a team, we had come up with two different solutions (Gap Closer 3000 and Mechanism 2) to potentially cover the gap and essentially create a gap filler of some sort.

Once we had decided to do train gaps, we had used the WWWWH (Who, What, Where, When, How) template and filled in all the necessarily details we needed to ensure that we had covered everything that we needed to in the presentation. Besides that, we also considered the pros and cons for each design and evaluated where exactly the mechanism was going to be inputted in, which had been decided to be onto the platform instead of the train due to the fact that it would essentially be easier to input on and would not require to break apart the train to input onto it which would take more time than placing on onto the platform.

Going through the two mechanisms, the Gap Closer 3000 uses pivot and sliding, as well as a gear and piston to function. Mechanism 2 on the other mostly uses a pneumatic cylinder which allows the platform to rotate more freely.

The Gap Filler 3000 is a lot less complicated than Mechanism 2 mainly because Mechanism 2 uses pneumatics and that is a higher degree of complexity. Mechanism 2 is also more costly when compared to Gap Closer 3000 due to its higher degree of complexity and use of pneumatics. Mechanism 2 however is more reliable and won't break as easily, it also has a higher degree of freedom.

As for my role and contribution, I focused more on finding out background information that one may need to know before continuing on to discuss our solutions. The background information that I found would be most useful for this presentation was 'What we had meant by train gap', 'Why exactly was the gap there in the first place' and 'Why had we decided to improve on it in the first place.'

Explaining briefly, the train gap is there due to the fact that trains aren't flexible as a whole which would mean that each train carriage would have to essentially turn and bend which needs space to avoid colliding with the platform. We had decided to improve on this mainly due to safety, many people get their foot stuck or lose their belongings due to the gap. Besides safety, there is also efficiency, we want to make it easier for people, regardless of their mobility, to get in and out on trains. But this would be more beneficial to disabled people as well.

Other contributions would include coming up with the pros and cons as well as filling up the template that was mentioned earlier. Prior to this, there was multiple designs that we had come up with, each of us had to design our own mechanism before voting on which one would deem more successful and more useful in stations. My design had not made it due to the fact that more space would be required to fully function the mechanism which would end up to be more costly and a larger waste of space.

Throughout the workshop, I had learned how to make and captivate the audience with a presentation as well as the basics of CAD that I am eager to implement onto and create better and new designs on new mechanisms in the future. Along with that, I also learned that communication in a presentation, both video and voice improve on a presentation by a lot. When one has good communication, the audience would be more willing or eager to listen and engage with the presenters instead of turning off video and just using voice, it is more impactful when communication is used effectively.

Overall, I had a great time and I'd like to thank the professors as well as the TAs for their hard work and dedication on an early Saturday morning.

[END of ESSAY]

Please do the followings:

1. First, define a rubric that will serve as the evaluation criteria.
2. Explain the existing theory behind determining the above rubric.
3. Use the rubric to evaluate the student's reflection essay above on a scale of 30 points.
4. Explain the reason why you gave the above points.

Evaluation Rubric Definition

1. Content (10 Points)

- Project Description (4 Points): Clarity and completeness of the project description, including title, goals, process, and conclusion.
- Role & Contribution (3 Points): Clear articulation of the student's role and contributions to the project.
- Reflection (3 Points): Depth and insightfulness of the reflection, including lessons learned and personal growth.

2. Clarity & Organization (10 Points)

- Structure (4 Points): Logical organization and flow of the essay.
- Language & Grammar (3 Points): Clear, concise, and grammatically correct writing.
- Engagement & Style (3 Points): Ability to engage the reader and effectively convey information.

3. Analysis & Critical Thinking (10 Points)

- Insight & Depth (4 Points): Demonstrating a deep understanding of the project and its implications.
- Problem-Solving & Innovation (3 Points): Evidence of creative thinking and problem-solving skills.
- Application of Learned Concepts (3 Points): Effective application of design thinking methods and other learned concepts.

Theory Behind the Rubric

The rubric is grounded in educational theories emphasizing content mastery, communication skills, and critical thinking. Bloom's Taxonomy informs the assessment of cognitive skills such as knowledge (project details), application (using design thinking), and analysis (evaluating pros and cons). The emphasis on clarity and organization is derived from writing pedagogy, which values coherent and articulate expression of ideas. The inclusion of reflection and critical thinking aspects

aligns with reflective practice theories in education, encouraging students to connect their learning with personal experiences and broader contexts.

Evaluation of the Student's Reflection Essay

Content (6/10 Points)

- **Project Description (3/4 Points):** The description is clear, but lacks depth in explaining the conclusion of the project.
- **Role & Contribution (2/3 Points):** Student's role is somewhat vague; more specific details about contributions could be provided.
- **Reflection (1/3 Points):** The reflection is somewhat superficial, lacking deep insights or learning outcomes from the project.

Clarity & Organization (7/10 Points)

- **Structure (3/4 Points):** The essay is well-organized but could benefit from clearer transitions between sections.
- **Language & Grammar (2/3 Points):** Generally clear, with minor grammatical errors.
- **Engagement & Style (2/3 Points):** The style is engaging, but could be more compelling in terms of narrative and expression.

Analysis & Critical Thinking (5/10 Points)

- **Insight & Depth (2/4 Points):** Shows understanding of the project but lacks deep insight into its broader implications.
- **Problem-Solving & Innovation (2/3 Points):** Some evidence of creative thinking, but more detailed examples would enhance this aspect.
- **Application of Learned Concepts (1/3 Points):** Limited demonstration of the application of learned concepts beyond basic design thinking methods.

Overall Score: 18/30 Points

Reasoning for the Given Points

The essay adequately describes the project and provides an overview of the student's role and contributions. However, it falls short in deeply reflecting on the learning experience and personal growth. The student mentions lessons learned but does not delve into how these lessons could be applied in future contexts. The essay is well-structured and mostly clear, but the language could be more polished and engaging. In terms of critical thinking, the essay demonstrates a basic understanding of the project and problem-solving but lacks depth in analysis and innovation. There is room for improvement in demonstrating how the student applied learned concepts to real-world problems.