

Student Essay Evaluation: 22 Points

November 17, 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]

Scoring of students' essays should be done based on the following rubric.

[SCORING RUBRIC]

Comprehensive Evaluation of Workshop Course (Total: 30 Points)

1. Technical Knowledge and Application (10 Points)

- Understanding of Concepts: Evaluates how well the student grasps the technological and theoretical concepts relevant to the project.
- Practical Application: Assesses the effectiveness of applying technical knowledge in practical situations, specifically in project design and development.
- Innovation and Problem Solving: Measures the creativity and innovation in addressing project challenges and proposing effective solutions.

2. Teamwork and Collaborative Skills (10 Points)

- Individual Role and Contribution: Looks at how clearly the student defines and fulfills their role within the team, and their contribution to the project.
- Team Interaction and Communication: Evaluates the student's ability to communicate and collaborate effectively within the team.
- Peer Engagement: Considers the student's participation in peer learning, support to team members, and contribution to the team's dynamics.

3. Reflective Learning and Personal Growth (10 Points)

- Self-Reflection and Insights: Assesses the depth of the student's self-reflection on personal learning and development throughout the project.
- Design Thinking and Process: Measures how well the student demonstrates the application of design thinking methods and management of the project process.
- Skill and Attitude Development: Evaluates the growth in the student's professional and soft skills, like critical thinking, adaptability, and communication.

Performance Levels and Point Allocation:

- Outstanding (10 Points): The student not only fulfills but also significantly surpasses all set criteria. Their work demonstrates exceptional understanding, creativity, teamwork, and introspection. They exhibit mastery in applying theoretical knowledge to practical scenarios and show remarkable initiative and innovation.
- Highly Competent (8 Points): The student consistently meets all expectations and often goes beyond them. Their work reflects a thorough understanding and application of concepts, effective collaboration, and thoughtful reflection. They demonstrate a strong ability to integrate knowledge with practical skills and show considerable proficiency in problem-solving and innovation.
- Competent (6 Points): The student meets the standard expectations in all evaluated areas. Their work shows adequacy in understanding and applying concepts, collaborating with the team, and reflective thinking. While they demonstrate basic competency, there may be a need for further development in depth, consistency, or innovation.
- Needs Improvement (4 Points): The student's work falls short of meeting the standard expectations in several key areas. There is a noticeable lack of depth or understanding in technical

application, collaboration skills, or reflective thinking. This level indicates that the student needs considerable improvement and guidance to reach the expected level of competency.

Application:

Each main item in the rubric is worth up to 10 points, making the total possible score 30 points. The students' performance in each area is assessed against the four performance levels: Outstanding=10 Points, Highly Competent=8 Points, Competent=6 Points, and Needs Improvement=4 Points, accordingly. This approach ensures a comprehensive and nuanced evaluation of the students' work, reflecting their technical abilities, teamwork skills, and personal growth through the workshop course. [END of SCORING RUBRIC]

Use the rubric to evaluate the student's reflection essay above on a scale of 30 points. Perform Holistic Scoring for each main item. This approach treats each main item (Technical Knowledge and Application, Teamwork and Collaborative Skills, Reflective Learning and Personal Growth) as a whole, evaluating the student's overall performance in that area. In Holistic Scoring, the three subitems for each main item serve as critical guiding parameters rather than direct scoring elements.

To evaluate the student's reflection essay based on the provided scoring rubric, let's break down the assessment into the three main categories: Technical Knowledge and Application, Teamwork and Collaborative Skills, and Reflective Learning and Personal Growth.

Technical Knowledge and Application (10 Points)

- Understanding of Concepts: The student demonstrates a clear understanding of the project's technical aspects, particularly the necessity and function of train gap mechanisms. They explained the rationale behind different designs and their implications.
- Practical Application: The student detailed the practical application of two different mechanisms to solve the problem, showcasing an effective use of technical knowledge in a practical situation.
- Innovation and Problem Solving: The essay reflects some creativity in addressing the challenge, particularly in comparing the two mechanisms and their suitability for the project. However, the depth of innovation could be further explored.

Score: *Competent (6 Points)* - The student meets standard expectations in understanding and applying concepts but lacks depth in innovation.

Teamwork and Collaborative Skills (10 Points)

- Individual Role and Contribution: The student clearly outlined their role, focusing on background research and contributing to the decision-making process.
- Team Interaction and Communication: There is evidence of effective communication and interaction within the team, particularly in the decision-making process for choosing the mechanism design.
- Peer Engagement: The student engaged with peers in a collaborative environment, contributing to the team's dynamics through their role.

Score: *Highly Competent (8 Points)* - The student consistently meets and occasionally surpasses expectations in their collaborative role.

Reflective Learning and Personal Growth (10 Points)

- Self-Reflection and Insights: The essay shows a good level of self-reflection, especially in understanding the importance of communication and audience engagement in presentations.

- Design Thinking and Process: The student applied design thinking methods, as seen in their use of the WWWWH template and evaluating pros and cons.
- Skill and Attitude Development: The student reflects on their learning, particularly in presentation skills and CAD basics, showing growth in both professional and soft skills.

Score: *Highly Competent (8 Points)* - The student demonstrates a thorough reflection and application of design thinking methods.

Total Score: 22 Points

This score reflects the student's adequate technical knowledge and application, strong teamwork and collaborative skills, and considerable reflective learning and personal growth through the workshop course.