

Essay Comparison: Workshop Evaluation

December 5, 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. 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.

3. 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.

4. 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 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

The following two essays were prepared by students according to the above instructions.

[STUDENT #2's 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 STUDENT #2's ESSAY]

[STUDENT #19's ESSAY]

I belonged to the Monster Truck group for the SHIP course this semester. Monster Trucks refer to over-height or over-weight vehicles that cause a great deal of damage to infrastructures. Recent cases of problems due to Monster Trucks include how over-height vehicles crashing into bridges crossing overhead, or the constant load of over-weight vehicles causing cracks and failures on roads over time. The goal of our team was to develop a creative solution that will prevent these accidents from happening in the future.

In order to accomplish this goal, first, each team member did a background research on current countermeasures. From this research, we found different countermeasures in different countries, including the placement of height clearance barriers, vehicle weight measuring checkpoints, and height measuring checkpoints. However, accidents by oversized vehicles repeatedly happen, and they are still a critical issue to the safety of road. Considering this reality, our team critically re-evaluated the current countermeasures. This evaluation helped our team to find key points such as limitations of current countermeasures, and what can be improved.

Based on this knowledge that we gained, our team moved on to our key mission, which was to tackle the issue of Monster Trucks. Individual brainstorming and research about possible new solutions were done, and was presented to the whole team during sessions. In this process, our team succeeded in coming up with several ideas, including using drones to detect oversized vehicles, implanting sensors to existing measuring checkpoints, and making ID cards that detect which vehicle is violating the height limits. Ideas which were similar or used the same technology were combined.

Finally, our team decided on approaching the Monster Truck issue from 3 solutions; UAV recognition system, Transport ID, and the Smart Toll Gate. From this point, our group broke up into 3 pairs, each in role of one solution. Within the pairs, each solution was developed further. Pairs decided the design, evaluated the feasibility, checked the technology required for the solution they were in charge of. By this way, the solutions were specified. In the sessions on Friday, each pair gave presentations of their achievements of improving their solution and gave feedback to each other. In the last few sessions, presentations of each solution were combined and edited to construct the final presentation from the Monster Truck group as a whole.

Each member of the Monster Truck team played an important role and contributed to the team throughout the project. My greatest contributions were finding the technology of WIM, and developing the design of Smart Toll Gate.

In the process of background research about our project, each member was assigned a country to do research on. I was in role of searching countermeasures taken in the United States of America, due to my personal background living there as a child. In order to tackle the issue of Monster Trucks, USA was using height clearance barriers which were bar like structures that notified the height limit to the drivers. Moreover, certain routes were designated only for large sized vehicles to prevent large vehicles from causing issue on regular roads. Additionally, what was the most interesting was the system called WIM. WIM stands for Weigh-In-Motion, and this system weighs the vehicle as it passes over a section on the road with sensors implanted underneath. In one of the classes, I introduced these solutions to my team, as examples of ideas we could build up on for our own creative solution.

Next, in the process of developing our original creative solutions, my largest contribution to the team was insisting the usage of a new version of WIM. Here, there were still several concepts to consider, such as the cost and feasibility. I contributed to the team by suggesting using a simple design to cut costs, or constructing WIM in key points like toll gates, where several oversized vehicles pass by. Due to the fact that another team member was thinking of a plan of measuring height with sensors at the toll gates, we decided to combine our ideas. This innovated version of a toll gate, which our group decided to name the Smart Toll Gate, aims to efficiently measure height and weight simultaneously. However, at this point, our idea was nothing more than a general imagination. Therefore, we spent much time discussing about the specific design, and researched what kind of technology will be required. I insisted to place the WIM before the toll gate and the height sensors inside the toll gate. Additionally, using the same sensors used in the toll gate, we decided to place them before structures including bridges or tunnels, to prevent oversized vehicles from entering areas where height is limited. Throughout the workshops in SHIP course, I acquired several skills and also gained knowledge from fields in Civil Engineering and Mechanical Engineering.

In the group discussions held each week, I improved my skill on discussing, thinking creatively, and presenting. In some of the earlier discussions, it was in fact somewhat difficult for me to discuss due to my lack of background knowledge in Monster Trucks, and uncomfortableness in group work. However, as the course moved on, my research ability improved, and I was able to get more involved in group discussions. I became more confident in discussing with my group, which lead to myself making better individual presentation. Additionally, with the help of my group members, I improved on thinking more creatively. Some ideas seemed impossible at first, but with thorough research and planning, we were able to develop it to the level of using the solution on site.

Moreover, from the weekly presentations from other groups, I learned several facts related to fields in Civil and Mechanical Engineering. I never knew the how surveys on radioactive power were imperative. Presentations from the Mechanical Engineering taught me that creativity in their field is the key to solving daily issues such as the gap between train and platform, making automatic doors, and so on. Groups working on stopping CO2 emission especially surprised me with the idea of using electric planes.

Overall, from SHIP, I was stimulated in several ways. Many of the international students amazed me and acted as role models in how to facilitate discussions, make questions, and present in a way that will improve each other. Interaction with different majors also let me learn topics I was unfamiliar before.

[END of STUDENT #19's ESSAY]

Compare and evaluate the above two essays according to the rubric specified below.

[SCORING RUBRIC]

Comprehensive Evaluation of Workshop Course

1. Technical Knowledge and Application (1/3)

- 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 (1/3)

- 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 (1/3)

- 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.

[END of SCORING RUBRIC]

Compare and evaluate two essays based on the three main criteria in the above rubric: Project Description, Role and Contribution, and Reflection and Insight. Summarize the comparison of the three main criteria and then determine which essay is better overall.

The final score should be as follows. If one is superior to the other even slightly, award +1 point to the superior essay, and -1 point to the other. If one is clearly superior to the other, award +2 points to the clearly superior essay, and -2 point to the other. If both are the same, give each a score of 0.

bution, and Reflection and Insight.

1. Project Description

- Student #2's Essay: This essay effectively describes the project of developing a mechanism to fill the gap between train platforms and trains, focusing on safety and accessibility, especially for disabled individuals. The description of the two solutions, "Gap Closer 3000" and "Mechanism 2," is clear, detailing their functionality and comparative advantages. The application of design thinking is evident in the use of the WWWWH template and the consideration of pros and cons.
- Student #19's Essay: This essay addresses the challenge of designing solutions to prevent infrastructure damage from oversized vehicles. It gives a comprehensive overview of the team's approach, including background research, idea generation, and final solutions like UAV recognition system, Transport ID, and Smart Toll Gate. The essay shows a structured approach to problem-solving, indicating a thorough understanding of design thinking.

Score: Both essays are strong in describing their respective projects. #2's essay is more focused on specific solutions, while #19's offers a broader overview of the project process. However, both demonstrate a good understanding and application of design thinking. Score: 0 for both

2. Role and Contribution

- Student #2's Essay: #2 emphasizes their role in researching background information crucial for understanding the project's context and relevance. They also contributed to the design process and the pros and cons analysis. However, the essay is somewhat limited in detailing the specific impact of these contributions on the project's outcome.
- Student #19's Essay: #19 provides a detailed account of their contributions, including researching countermeasures in the USA and developing the Smart Toll Gate concept. The essay shows a clear link between their contributions and the project's advancement.

Score: #19's essay demonstrates a more substantial and direct impact on the project through their contributions, while #2's contributions, though valuable, are less directly linked to project outcomes.

#19: +1, #2: -1

3. Reflection and Insight

- Student #2's Essay: #2 reflects on what they learned about presentation skills, CAD basics, and the importance of effective communication. This shows personal growth and an understanding of the importance of soft skills in engineering projects.

- Student #19's Essay: #19 discusses improvements in discussion, creative thinking, presentation skills, and increased confidence in group settings. They also reflect on learning from other groups and the exposure to interdisciplinary knowledge.

Score: Both essays show good self-reflection and personal growth. #2 focuses more on presentation and communication skills, while #19 demonstrates broader personal development and interdisciplinary learning. #19: +1, #2: -1

Overall Evaluation

Based on the criteria:

- Technical Knowledge and Application: Both essays are strong, with a detailed understanding of the project and practical application of knowledge. Score: 0 for both
- Teamwork and Collaborative Skills: #19's essay shows a clearer and more impactful contribution to the team. Score: #19: +1, #2: -1
- Reflective Learning and Personal Growth: #19 shows a broader range of personal growth and skill development. Score: #19: +1, #2: -1

Final Score: Student #19's essay is better overall, demonstrating a more substantial contribution to the project and broader personal growth.

- Student #19: +2 (superior in both Teamwork and Reflective Learning)
- Student #2: -2 (inferior in the same categories)