

Student Essays Comparison Score

December 7, 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 #8's ESSAY]

I was in the Net-Zero transportation group and our project was based on the reduction of the CO₂. We mainly focused on the aircraft industry. The rate of emission of CO₂ in the total global CO₂ emission is small comparing to other industries. However, this is because aircraft travels around the world, and the international emission is not included in each country's emission. Therefore, it is important for the airplane industry to work to solve the problem of the emission of the CO₂.

To solve the problem, we focused on introducing the electric airplane in normal flights. Electric airplane uses only electricity to fly. If we have enough electricity to use for normal flights, the emission of the CO₂ from aviation is said to be reduced by 87%. However, there are many problems that stops the electric airplane to be normalized. In our project, we pointed out some of the most important problems and tackled them. The problems that we investigated were battery efficiency, weight of the battery and the charging electricity. To tackle the problems, we divided the problems into three big sections, which are science, charging and cost.

In the science section, we compared two types of batteries which are lithium-ion battery and solid-state battery. Lithium-ion battery is a common battery that is being used in our society like the electric cars. Solid-state battery is a battery that has many advantages. Since they don't use liquid, we do not have to worry for leakage during flights. Adding to this, the charging is faster for solid-state battery than Lithium-ion.

In the charging section, we mainly focused on the way of recharging the plane. We considered to recharge the electric plane during the flight since charging a battery from an empty battery is hard. Adding to this, we tried to work on with where we are going to afford all the electricity.

In the last section, cost, we lastly combined our ideas and summarize the cost that it will totally take to create and use all-electric plane. We considered the amount of cost we can offer the airplane ticket due to the maintenance, electricity, cabin fee and other supplies. We compared this value with the current cost for jet fuel airplane and we summarized that the fuel price and the maintenance in electric plane can be reduced from approximately 3.1M\$ to 2000\$.

During the project, I mainly worked on with the cost of the electricity. First, I only considered about the cost of the electricity itself and looked at the current price. However, as class went on, I noticed that considering only about the current price does not help our project. This is because our project cannot be started immediately. Electric airplane is an important project should be considered immediately. However, there are still many problems that needs to be considered. Therefore, electric airplane is a project that needs to be experimented in a long term.

In our project, we considered electric airplane to be achieved to be used in normal market by 2035. Therefore, I needed to consider the price of electricity at that time. Adding to this, I noticed that the price of the electricity will be affected by the amount of electricity we need. The need of electricity is rising time by time and if we ask for more electricity to the powerplants that we have right now, it is obvious that the electricity price will rise. Adding to this, the trend of producing electricity is tilting to be eco-friendly. This means that we need to also depend more on renewable sources. Due to the aim, made me possible to think to add an option about creating a new powerplant to afford all the electricity we need.

The cost needed for creating a new powerplant is called Levelized Cost of Electricity and found out that LCOE is the summation of two costs, which are Capital expenditure and Operation expenditure. Capital expenditure is the initial price for building the facility. The operation expenditure is the cost that we need to run the facility in the future. I looked for the LCOE price for Solar power and Wind power. These were chosen because the CO₂ emission was smaller than other technologies. I created a graph that shows the change of the price of the LCOE cost during time and read the trend of the cost through it. I have also calculated the jet fuel price for reference. At the end I summarized that Solar power photovoltaic utility showed to be the most reliable technology we could in our project. My part helped our project to be lower cost, since fuel is the largest part that is included in the cost of the price of the seat for airplanes now.

The workshop we did just after the mid term presentation was fun. The workshop was about giving new and unique ideas for a group that we are not mainly working on. I went to the Monster truck group and gave an idea that changes the height of the floor and not the bridge, tunnel, or the pole. It is simply fun for people who is not in the main group to give unique ideas to other groups even though it is not achievable. Adding to this, doing the workshop in small groups made me understand the topics of other groups more and made me feel more interested about the project, than just listening to the presentation they give to the whole class. This is because smaller groups helped us to ask more questions. However, I think that giving new ideas widen the way of thinking for the main group.

When people focus on one idea, it is hard for them to notice other people's perspectives that might help them make their idea more interesting and achievable.

I was also able to learn how to ask questions after the presentations. I found it hard to ask questions to other groups but the frequent question section and listening to other people asking question helped and taught me how to ask a good question.

[END of STUDENT #8's ESSAY]

[STUDENT #20's ESSAY]

I was in the Monster group for this course, SHIP Research Planning and Skill A. Monster truck refer to oversized vehicles that have excessive weight and height. Our group focused on how these vehicles damage the infrastructure. I learned that over-weight vehicles can affect both bridges and roads. For instance, cracks at the structure of the bottom part of the bridge can be caused when an overweight vehicle repeatedly drives over. After studying the accidents caused by the Monster trucks and the current countermeasures for them, we decided that our goal was to generate solutions that would help maintain safe and secure infrastructure while having these types of vehicles.

I started thinking about my solutions by researching current solutions that are available. When researching I did not specify a region or a country as I wanted to collect different kinds of solutions. Also, because different regions will have varying environments with different traffic standards, I assumed that I could encounter solutions that I would not usually see or come up with. One of the existing solutions that I found interesting was the idea of using a monitoring device only for oversized trucks. The reason I focused on this solution is that it seemed to work in almost any road environment. Studying existing solutions is effective as it allows the solution to be more feasible. The fact that it is already being used in real life indicates that this solution is more doable than those that are not.

After choosing an existing solution I combined the solution with my ideas. This was how I invented my solution, Transport ID. It was necessary to generate new ideas so that it is an improved version of the solution. The improved idea would have new features that would solve the problems of the current solution. For instance, I added a data encryption feature to the Transport ID. I thought that this feature is necessary to prevent other parties such as the drivers from falsely inputting the data and cheat their way into unpermitted roads.

The Monster Truck group was divided into three subgroups each in charge of one solution so that we would have three solutions in total. I was in the Transport ID group as I was very involved in generating the solution. Hence, one of my roles in the Monster Truck group was to develop Transport ID as one of the solutions for our goal to maintain a safe and secure infrastructure. As the inventor of the Transport ID, I came up with its design. When creating the design diagram for the Transport ID I made sure that it was easy to understand. I avoided adding too many details to avoid confusion but enough information to show what the ID could do. In addition, I generated features that would solve the problem of current solutions, and finally, I considered and proposed the feasibility of this invention.

I also contributed to the group by asking questions to other group members. By asking questions and commenting on some of the details, I feel that they were able to reflect on their solution that they generated. I was able to go through the same process. When I was asked questions, I would add more details to the presentation so that it was more easily understood. In addition, I would also speak to the other groups about our group. I would often briefly talk about the solutions that we generated and the improvements we realized that we need to make the solutions more effective and feasible. This allowed me to summarize the things we have done that day so that we can acknowledge the progress of our project.

One of the important things I learned while participating in this workshop is the importance of asking questions to my group members and to other groups in the workshop. When I was asked a question by other people I noticed some aspects that need to be improved which I would have not noticed if they did not ask about it. When they pointed out these aspects, I was able to make improvements on it so that my solution became more efficient and feasible. Not only the questions but I learned that comments from other people during a workshop are helpful. The comments were often new ideas that

could be added to the solutions I generated. More comments meant that more features were added to the inventions and they would solve more issues related to the pre-existing solutions.

Another procedure I realized was important was frequently having short meetings while working on the presentation. Often times, I would have a meeting with the group members in the very beginning to divide the work. After working on the presentation, we would have our second and final meeting to make sure that all parts of the project are complete. Nonetheless, I noticed that having frequent meetings, more than twice is more helpful. During this project, I received more comments that significantly made my solution more effective and feasible due to the more frequent meetings we had.
[END of STUDENT #20'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.

To compare and evaluate the two student essays, I will use the specified rubric, focusing on three main criteria: Project Description, Role and Contribution, and Reflection and Insight. I will summarize the comparison of these criteria and then determine which essay is better overall.

1. Project Description

Student #8 (Net Zero X Project)

- #8 provides a comprehensive description of their project, focusing on the development of an all-electric airplane to reduce CO2 emissions in the aviation industry.
- The essay details the specific challenges addressed, such as battery efficiency and charging, and gives a clear overview of the project's goals and conclusions.
- The description demonstrates a good understanding of the technical aspects and the practical application of these concepts.

Student #20 (Monster Track Project)

- #20 describes the issue of infrastructure damage by oversized vehicles and their group's approach to generating solutions.
- The project's goals and the process are clearly articulated, with an emphasis on studying existing solutions and innovating upon them.
- The technical understanding is evident, but the focus is more on the application of existing solutions rather than developing new technological ideas.

Comparison

- Both students provide clear and detailed project descriptions.
- #8's description includes more innovation and technical details, while #20's focuses more on the application of existing solutions.
- Score: #8 +1, #20 -1

2. Role and Contribution

Student #8

- #8's role centered around analyzing the cost of electricity and its future trends, contributing significantly to the project's financial feasibility.
- The student showcased their contribution to solving a critical aspect of the project, demonstrating a depth of involvement and technical application.

Student #20

- #20's contribution was in the invention of 'Transport ID', a novel solution for monitoring oversized vehicles, indicating a high level of involvement and creativity.
- #20 also took an active role in group discussions and the development of their idea, showing strong individual contribution.

Comparison

- Both students had significant and well-defined roles in their respective projects.
- #20 showed more innovation in creating a new solution, while #8 focused on a critical aspect of an existing idea.
- Score: #8 0, #20 0

3. Reflection and Insight

Student #8

- #8 reflects on the learning process, emphasizing the importance of considering long-term implications and the broader impact of their project.
- There is a clear indication of personal growth, particularly in understanding the complexities of technology implementation.

Student #20

- #20 discusses the importance of asking questions and engaging with other team members, highlighting the learning process in a collaborative environment.
- The reflection shows personal growth in understanding teamwork dynamics and the importance of continuous feedback.

Comparison

- Both students demonstrate a good level of self-reflection and insights gained from the workshop.
- #8's reflection is more focused on the technical and long-term aspects, while #20's is centered around teamwork and collaboration.
- Score: #8 0, #20 0

Overall Evaluation

- Student #8: Total Score +1
- Student #20: Total Score -1

Overall, Student #8's essay is slightly superior, mainly due to the depth and innovation in the project description. Both essays are strong in their respective areas, but #8 shows a marginally better understanding and application of technical knowledge, which is crucial for the workshop course