

Comparing Student Essays - #19 vs. #20

December 9, 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 #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 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]

[STUDENT #20's ESSAY]

I was in the Monster group for this course, SHIP Research Planning and Skill A. Monster truck refers 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 evaluate the two essays from students #19 and #20 based on the provided scoring rubric, we will compare them across the three main criteria: Technical Knowledge and Application, Teamwork and Collaborative Skills, and Reflective Learning and Personal Growth.

1. Technical Knowledge and Application

Student #19

- Understanding of Concepts: Demonstrates a good understanding of the technological aspects of the Monster Truck project, including specific technologies like WIM (Weigh-In-Motion).
- Practical Application: Effectively applies this knowledge to develop the Smart Toll Gate concept, showing practical application of their research.
- Innovation and Problem Solving: Shows creativity in integrating WIM technology into the toll gate system and exploring new ideas like using drones and sensors.

Student #20

- Understanding of Concepts: Shows an understanding of the issues caused by Monster Trucks but lacks specific technological details compared to #19.
- Practical Application: Focuses more on the conceptual side, like the Transport ID, but doesn't delve as deeply into the technical aspects or practical implementation.
- Innovation and Problem Solving: Demonstrates some creativity with the idea of Transport ID and data encryption, but less technological innovation compared to #19.

Score: #19 +1, #20 -1

2. Teamwork and Collaborative Skills

Student #19

- Individual Role and Contribution: Clearly defines their role, focusing on research and technology development.
- Team Interaction and Communication: Shows active participation in team discussions and presentations, contributing ideas and feedback.
- Peer Engagement: Engages well with team members, although there is less emphasis on peer learning compared to #20.

Student #20

- Individual Role and Contribution: Actively involved in the development of the Transport ID, including its design.
- Team Interaction and Communication: Demonstrates good communication skills, engaging in questioning and feedback.
- Peer Engagement: Shows a strong focus on engaging with peers, asking questions, and learning from others.

Score: #19 0, #20 0

3. Reflective Learning and Personal Growth

Student #19

- Self-Reflection and Insights: Provides a thorough reflection on their personal learning and growth in skills.
- Design Thinking and Process: Demonstrates a good understanding of the design thinking process and its application.
- Skill and Attitude Development: Reflects on improvement in skills like research, creativity, and presentation.

Student #20

- Self-Reflection and Insights: Reflects well on personal learning, particularly in understanding the importance of questioning and feedback.
- Design Thinking and Process: Less detailed in explaining the design thinking process but shows understanding of its importance.
- Skill and Attitude Development: Strong focus on the development of soft skills, like communication and adaptability.

Score: #19 0, #20 0

Overall Comparison and Final Score

- Technical Knowledge and Application: #19 demonstrates greater technical depth and innovation, leading to a higher score.
- Teamwork and Collaborative Skills: Both students show good teamwork and collaborative skills, leading to an equal score.
- Reflective Learning and Personal Growth: Both students display strong reflective learning and personal growth, leading to an equal score.

Final Score: Student #19 +1, Student #20 -1

Overall, while both essays are strong, Student #19's essay demonstrates a slightly superior understanding and application of technical knowledge, leading to their essay being rated slightly higher overall.