

#19's essay excels overall

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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 #1's ESSAY]

Our presentation title is "Train Gap Filler", which statedly reveals our goal of designing new mechanisms. In our project, we first explained the significance of train gap: there is the possibility for the train to hit into the station. However, the gap still causes to some safety and efficiency issues. Therefore, we came up with two designs to fill the train gap and solve this problem; they apply different mechanisms. One used pivot, sliding, gear, and piston (giving three pivots, and would lay

down the platform); this one is comparatively more cost friendly and simpler. The other is formed with pneumatic cylinder (raising the platform) which is more expensive and complicated, yet more reliable and owns higher degrees of freedom. They both have pros and cons, but still aim for the same goal.

I also created four designs by myself, although it is not used in this presentation. Three of them are pretty similar (I actually developed two others based on my first design), which are composed of gears and rack rods. The other one applies fluid (hydraulic) pressure. In my first design, the rack rod is stucked on the door that, when door opens, will drive location fixed gear, location-fixed gear, and rack rod, making the rack rod extending out, so the platform stucked on it will show up and fill the train gap. This is similar to my second design: But the platforms move from vertical to horizontal instead of just move in and out horizontally, so it is no needed to create another space under the door to place the platform when it is kept in (this one just stand close to the wall /door). And my third design, also similar to the last two: But in this design, I added the mechanism of “tension and pulling”, so the platform is laid down and closed up by the wire. And my fourth design is much more different from the last three (I only drew the righthand-side half): You can think the two cylinders are connected syringes, so when one side is pushed in (e.g. door side), the other side (e.g. platform side) will be pushed out. Although my designs are not chosen to be presented, I still contributed some ideas and make innovations by myself which I found very reassured and interested.

For this project, I was firstly suggested the application of hydraulic pressure to drive the whole system. I think that kind of gave Takato some ideas of making his design (Design 2). As the result, I asked him if he needs any help with the final presentation, since I can thoroughly understand his design, but he himself is strong and smart to handle it. Anyways, I worked on my part only, which is the summary. I feel sad that I did not have enough time to summarize the whole project and our achievements during the presentation time, having most of my part being omitted. So I want to put it here. Overall, I looked back on all we have done during this quarter. In the very beginning, we learned the basics of Fusion 360, the software to draw designs, so we are able to create 2D sketches (side-view) and extend it into 3D models. Furthermore, I make our model to be movable. We took our first Fusion Homework and created a pivot (cylinder) overgoes the model, so the model can rotate on it. Although we were trying to make a motor, so it can rotate automatically, but due to the time limitation, we did not do that. And then, we discussed about the mechanisms used in our daily life, we each suggested one to two example(s), for instance bicycle, mechanical pen, wireless charging, and for me, I picked the key and mop. And finally, we voted for the “train gap” to be the topic of this final presentation. We aim to cover up the gap between the train and station to prevent people from being tripped on it or drop anything into the gap, and thus interrupt the whole process of train and people’s movement. After we decided our topic, we each created one to two designs, but we only chose two from all and extended on them (I originally want to show everyone’s works but some members lost their designs, so I did not do so). And in all, we want to minimize the cost and gap distance, and simplify the mechanism for our design to achieve the ideal state. Although we have not had the chance to discussed on it in deep.

In my perspective, I think this class have taught me a lot, including the aforementioned mechanisms, physics, and software application knowledge and also collaboration skills. Since we are in groups and required to work and present together, it is significant to have high efficiency of communication about everything, like choosing topics, deciding work distribution, exchanging and discussing ideas. At the beginning, we did not know each other well and felt awkward talking to each other, so most of the time we were in silence, needing the TA to guide the process. But now, we can discuss very smoothly, and the TA only need to assist us and answer some of our questions instead of talking all the time. Furthermore, we are not only discussing with our groupmates but also people from other groups. From these experiences, I also learned to talk to people I am unfamiliar with without awkwardness or shyness; this also gives improvement when I am doing presentation. In addition, I think the work of asking question, giving feedback, or summarizing the class has helped me a lot. Initially, to be honest,

I hate this work since I really feel uncomfortable talking in front of many people. Yet after several times of practice, I think I have more courage and can feel more relaxed doing so. On the other hand, giving feedback trains me to think critically by myself but not just listen to what others say. It also makes me develop my expression, so I can quickly, effectively, and precisely convey my idea to the presenter(s). So overall, I appreciate to have this class that teaches me the presenting, thinking, and collaborating skills.

[END of STUDENT #1'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.

To evaluate the essays of Student #1 and Student #19, we'll assess them based on the three criteria of the scoring rubric: Technical Knowledge and Application, Teamwork and Collaborative Skills, and Reflective Learning and Personal Growth.

1. Technical Knowledge and Application

- Understanding of Concepts:
 - #1: Demonstrates a clear understanding of the technical challenges and concepts in designing gap fillers for train platforms, including details of various mechanisms.
 - #19: Shows comprehension of the challenges posed by oversized vehicles on infrastructures, along with an understanding of current countermeasures and their limitations.
 - Evaluation: Both students show a good grasp of their respective topics, but #1's detailed description of the mechanisms offers a slightly deeper understanding. #1: +1, #19: -1
- Practical Application:
 - #1: Describes the application of various mechanical concepts in the design process but lacks specific examples of how these designs could be practically implemented.
 - #19: Details the process of conceptualizing and refining practical solutions, such as UAV recognition systems and Smart Toll Gates, showing a strong link between theory and practice.
 - Evaluation: #19 better demonstrates the practical application of technical knowledge. #1: -1, #19: +1
- Innovation and Problem Solving:
 - #1: Exhibits innovation in creating multiple design concepts, although these were not used in the final presentation.
 - #19: Discusses innovative solutions like the integration of WIM with toll gates, showing a creative approach to problem-solving.
 - Evaluation: Both essays display creativity, but #19's solutions are more integrated and practically focused. #1: 0, #19: 0

2. Teamwork and Collaborative Skills

- Individual Role and Contribution:
 - #1: Details their own design efforts and contributions to the project, though these were not included in the final presentation.

- #19: Explains their research role and significant contribution in developing the Smart Toll Gate concept.
 - Evaluation: Both students clearly state their roles, but #19's contributions are more directly connected to the team's final output. #1: -1, #19: +1
- Team Interaction and Communication:
 - #1: Describes some level of interaction within the team but focuses more on individual work.
 - #19: Highlights effective communication and collaboration within the team, especially in developing combined solutions.
 - Evaluation: #19 demonstrates stronger team interaction and communication skills. #1: -1, #19: +1
- Peer Engagement:
 - #1: Mentions helping a teammate and participating in group discussions, but the focus is more on individual contributions.
 - #19: Discusses engaging with the team and contributing to group brainstorming and decision-making.
 - Evaluation: #19's essay shows more active peer engagement and contribution to team dynamics. #1: -1, #19: +1

3. Reflective Learning and Personal Growth

- Self-Reflection and Insights:
 - #1: Reflects on personal development, focusing on improved presentation and communication skills.
 - #19: Discusses improvements in discussion skills, creativity, and presentation abilities, offering a broader perspective on personal growth.
 - Evaluation: Both students show good self-reflection, but #19 offers a slightly more comprehensive insight into personal development. #1: -1, #19: +1
- Design Thinking and Process:
 - #1: Shows some application of design thinking in developing various concepts but lacks detail on the overall process management.
 - #19: Clearly outlines the process of ideation, development, and refinement of solutions, demonstrating effective design thinking.
 - Evaluation: #19 better articulates the application of design thinking methods in project management. #1: -1, #19: +1
- Skill and Attitude Development:
 - #1: Discusses development in specific skills like software usage and presentation, with a focus on individual growth.
 - #19: Reflects on a broader range of skill development, including research, creativity, and teamwork, along with personal attitude changes.
 - Evaluation: #19 shows more comprehensive development in both professional and soft skills. #1: -1, #19: +1

Summary and Overall Evaluation

- Technical Knowledge and Application: #1: -1, #19: +1
- Teamwork and Collaborative Skills: #1: -3, #19: +3
- Reflective Learning and Personal Growth: #1: -3, #19: +3

Overall, Student #19's essay demonstrates a stronger performance across all three criteria, particularly in teamwork and personal growth aspects.

**Final Score: Student #1: -7,