

# Student Essays Evaluation: #1 vs #14

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 CO<sub>2</sub> emissions from airplanes. It involves researching the current challenges faced by the airline industry regarding CO<sub>2</sub> 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 #14's ESSAY]

The goal of this project is to design a questionnaire to understand the public's thoughts and concerns about the disposal of high-level radioactive waste, and one which can at the same time give the respondents some information and a general idea about the disposal of high-level radioactive waste. Then by gathering the results and by analyzing the results we aim to understand the public and at the same time assess the questions in the questionnaire to see if the questions are able to earn the information or results that our group wants and to modify any questions. The importance to understand the public's thought and concerns about the disposal of high-level radioactive waste all lies in the point that the disposal of high-level radioactive waste is not carried out because of the lack of public approval. So, by understanding about the public, we could think of ways to earn the approval by the public.

Through the two months working in this project, we were able to design and analyze two questionnaires. One questionnaire was designed for the people in the SHIP class, there were 40 responses and through the analysis we concluded that the questionnaire had confusing wording and there was a need to modify the words. The other questionnaire was designed for the public, there were 133 responses and through the analysis we concluded that the public only has a little knowledge about high-level radioactive waste, does not know the details of the disposal of high-level radioactive waste and that most accept that the waste should be disposed in their own countries.

Throughout the project what we have done was to design questions. When doing so, we first thought of what specifically we had to know about the public, then after that we thought of the type of format that is suitable for what we want to know and after that we chose the appropriate choices for the question. Finally, we shape it up and make it into a question and modify the wording so it would fit the target respondent.

I thought that my role in this project was an idea giver, analyzer, and translator. I thought that I was an idea giver as I thought that I have contributed to the project by thinking of new ideas for the question of the questionnaire. For example, I have thought of the idea for the question number 11 which asked the closest radius that the respondents can accept the disposal site of high-level radioactive waste, this question intends to find an image of a specific distance that the public can accept, by knowing a distance that the public can accept it could be used for the consideration of the disposal site of high-level radioactive waste.

I thought that I was an analyzer as I had contributed in the analysis of the results. When talking about the analysis, I have contributed especially on the analysis to divide the respondents of the Japanese questionnaire into public and experts. When dividing the respondents we had to analyze many of the technical issue related questions and free answer questions, so as one of the native Japanese speakers I had to analyze the people's answers and see if there were any respondents that could be classified as "experts". For example, although we gave an overall classification by seeing whether the respondents answered that they have done any scientific research related to the disposal of high-level radioactive waste, some respondents who was not classified as experts was then classified as an expert as their response to the free answer question was an answer which a person with expert knowledge could only answer. I thought that I was a translator as I have contributed in the creation of the Japanese questionnaire. Like I have previously explained, as I was one of the native Japanese speakers in our group, after the English questionnaire was made, I have done the translation of the questionnaire into Japanese.

As our group's project was different to other groups, I thought that it was very hard but interesting to do the project. On the other hand, as our group's project was different to other groups, many of the

things that we learnt in the SHIP lecture was hard to apply into the project. I thought so because our groups project aimed to design a questionnaire to understand the public, while for the other groups project they aimed to find, or think of a solution to a problem that they found, which is very different and as the previous SHIP workshop and this SHIP workshop both focused on trying to find a problem and then think of a solution, it was hard to apply.

From the series of workshops, I thought that I have learnt the importance of sharing each person's idea no matter how small or boring it might look. Through out the SHIP workshops each group had to think, or find a problem and a solution to it and in this process all the members in the project had to think of some ideas, but when thinking of ideas there would always be some ideas that may seem very small or meaningless for the person and the person usually won't present that. On the other hand I learnt that it is important to present any small idea as these ideas could then be a trigger for other members or even yourself to think of new ideas.

[END of STUDENT #14'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 student essays against the rubric, we will compare them across three main criteria: Project Description, Role and Contribution, and Reflection and Insight.

## **1. Project Description**

Student #1:

- Understanding of Concepts: #1 shows a good grasp of the technological and theoretical concepts, explaining the safety issues related to train gaps and proposing multiple mechanism designs to address the problem. The technical details of the pivot, sliding, gear, and piston mechanisms, as well as the hydraulic pressure concept, demonstrate a strong understanding.
- Practical Application: The application of these concepts in practical designs is evident, though there's less emphasis on how these designs were tested or refined.
- Innovation and Problem Solving: #1 displays creativity by designing four different mechanisms, showcasing problem-solving skills. However, there's limited discussion on how these ideas were evaluated or selected.

Student #14:

- Understanding of Concepts: #14's essay focuses on designing questionnaires to understand public perception of high-level radioactive waste. The project involves less technical knowledge and more on research and analysis.
- Practical Application: The practical application of designing and analyzing questionnaires is evident, but it's more research-oriented than technical.
- Innovation and Problem Solving: There's innovation in the approach to understanding public opinion and modifying questionnaires based on feedback, but it's less about technical problem-solving and more about research methodology.

Comparison: #1's project involves more technical depth and application, whereas #14's project, while innovative, leans more towards research and analysis.

Score: #1: +1, #14: -1

## **2. Role and Contribution**

Student #1:

- Individual Role and Contribution: #1 describes their role in idea generation and design, though their contributions seem more individualistic and less integrated into the team's final output.
- Team Interaction and Communication: There's mention of team discussion and decision-making, but limited detail on how #1's ideas influenced the team's final decisions.
- Peer Engagement: Engagement seems more focused on individual work rather than collaborative efforts.

Student #14:

- Individual Role and Contribution: #14 clearly defines their role as an idea giver, analyzer, and translator, indicating a multifaceted contribution to the project.

- Team Interaction and Communication: #14's involvement in questionnaire design and analysis suggests active participation in team discussions and decision-making.
- Peer Engagement: The essay reflects engagement with team members through idea sharing and collaborative analysis.

Comparison: #14 demonstrates a more collaborative approach and clear contribution to team dynamics compared to #1.

Score: #1: -1, #14: +1

### 3. Reflection and Insight

Student #1:

- Self-Reflection and Insights: #1 reflects on their learning journey, mentioning how they developed skills in presenting, thinking, and collaborating.
- Design Thinking and Process: There is some discussion about the design process, but it's more focused on individual work than on the team's collaborative process.
- Skill and Attitude Development: #1 shows growth in communication and presentation skills, as well as critical thinking.

Student #14:

- Self-Reflection and Insights: #14 provides insights into the importance of sharing ideas and learning from group discussions.
- Design Thinking and Process: The essay shows an understanding of the research process, though it's less about design thinking in a technical sense.
- Skill and Attitude Development: #14 demonstrates development in analytical skills and the ability to translate ideas into actionable research.

Comparison: Both students show good self-reflection and personal growth, but #14's insights are more aligned with collaborative learning and applying workshop teachings.

Score: #1: 0, #14: +1

### Overall Comparison and Final Score

Student #1: Total Score = -1 (1 for Project Description, -1 for Role and Contribution, 0 for Reflection and Insight)

Student #14: Total Score = +1 (1 for Role and Contribution, 1 for Reflection and Insight, -1 for Project Description)

**Final Evaluation:** Student #14's essay is slightly better overall, demonstrating a stronger emphasis on teamwork, collaboration, and reflective learning, despite having a less technically oriented project. Student #1's essay shows stronger technical understanding but lacks in team dynamics and integration of personal contributions into the group project.

