

Rubric for Student Essay

November 16, 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. Kinematic Synthesis of Mechanisms <Say “NO” to Door Knobs>

This project develops a new mechanism for touchless doors, inspired by the widespread unease with touching door handles in public spaces like schools, hospitals, and restrooms during the Covid-19 pandemic. This design aims to eliminate the need for physical contact with door knobs.

3. Net Zero X <Carbon Dioxide Removal>

Given that emissions of CO₂ are produced by all sectors of society, identifying effective ways to capture CO₂ and store it safely is crucial. Create methods to extract CO₂ from the air and separate it into its constituent elements, carbon and oxygen, and explore how these elements can be repurposed effectively.

4. 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.

5. 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.

6. 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 six 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

Here is a student essay to be evaluated.

[STUDENT 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 in 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 ESSAY]

Please do the followings:

1. First, define a rubric that will serve as the evaluation criteria.
2. Explain the existing theory behind determining the above rubric.
3. Use the rubric to evaluate the student's reflection essay above on a scale of 30 points.
4. Explain the reason why you gave the above points.

1. Evaluation Rubric Definition

The evaluation rubric for the student's reflection essay will consist of three main criteria, each worth 10 points, totaling 30 points:

A. Project Description (10 Points)

- Clarity and Detail (0-4 Points): Assessing the clarity and depth in describing the project title, goal, and conclusion.
- Process and Design Thinking Application (0-4 Points): Evaluating the explanation of the project process and how design thinking methods were applied.
- Relevance and Coherence (0-2 Points): Judging the relevance of content to the project and overall coherence of this section.

B. Contribution (10 Points)

- Role Identification (0-3 Points): Clarity in describing the student's role in the project.
- Contribution Detail (0-4 Points): Depth of explanation about the student's specific contributions to the project.
- Impact and Initiative (0-3 Points): Assessing the impact of the contribution and the initiative shown.

C. Reflection (10 Points)

- Insightfulness (0-4 Points): The depth of insight and learning derived from the workshop series.

- Personal Growth (0-3 Points): How the student describes their personal growth in skills, confidence, and collaboration.
- Communication and Critical Thought (0-3 Points): Quality of self-expression, critical thinking, and ability to reflect on experiences.

2. Theoretical Basis for the Rubric

The rubric is grounded in educational and psychological theories relevant to reflective learning and skill assessment:

- Bloom's Taxonomy: Emphasizes different levels of learning from basic recall to complex analysis and evaluation, useful in assessing the depth of the student's understanding and reflection.
- Kolb's Experiential Learning Theory: Highlights the importance of reflection in learning, providing a basis to evaluate how well students connect their experiences to learning outcomes.
- Constructivist Learning Theory: Emphasizes the learner's active role in constructing knowledge, relevant in assessing how students describe their contribution and the learning process.

3. Evaluation of the Student's Reflection Essay

A. Project Description (6/10)

- Clarity and Detail: 3/4. The student clearly mentions the project title and goal but lacks depth in explaining the conclusion.
- Process and Design Thinking Application: 2/4. The process is described, but the application of design thinking methods is not explicitly detailed.
- Relevance and Coherence: 1/2. The section is relevant but somewhat lacks coherence in transitioning between ideas.

B. Contribution (7/10)

- Role Identification: 2/3. The role is somewhat clear, but not distinctly outlined.
- Contribution Detail: 3/4. Details of contribution are given, but the impact on the project could be more explicit.
- Impact and Initiative: 2/3. Demonstrates some initiative and impact, particularly in idea generation, but lacks depth in describing the influence on the project's outcome.

C. Reflection (8/10)

- Insightfulness: 3/4. Shows good insight into what was learned but could delve deeper into specific learnings.
- Personal Growth: 3/3. Effectively communicates personal growth in skills and confidence.
- Communication and Critical Thought: 2/3. Demonstrates ability to reflect and express thoughts, but could benefit from more critical analysis of experiences.

4. Reasoning for the Allocated Points

- Project Description: The student provides a clear description of the project but lacks in-depth analysis of the conclusion and explicit connection to design thinking methods.
- Contribution: The student's role and contributions are described but could be more impactful and detailed. There's evidence of initiative, but the direct impact on the project's success is not strongly articulated.

- Reflection: The essay reflects good insight and personal growth, particularly in skills and confidence. However, it could be improved with more critical analysis and depth in reflecting on specific learning outcomes and experiences.

Overall, the essay scores 21/30, showing strengths in reflection and personal growth, with room for improvement in detailing the project's conclusion and the student's specific impact on the project.