

Essay Evaluation Rubric

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]

As a group, we constructed a project named science communication on high-level radioactive waste, based on the reason that there may exist some misconceptions or knowledge gap between the general public and the organizations dealing with nuclear activities. The main objective of our project is to find out the public's concerns and understanding of high-level radioactive waste. Since our topic is about communicating on the high-level radioactive waste, we decided to have a questionnaire as a way of communication. Our project includes two questionnaires and results analysis on the responses from the questionnaires trying to identify the major considerations of the general public towards the management and disposal of high-level radioactive waste.

After receiving a general image of what is high-level radioactive waste from our facilitator professor, the students discussed on what kind of questions will be sent to the public and designed suitable questions that involve critical thinking for the respondents. The first questionnaire was a trial targeted mainly to the students and facilitator from the SHIP course, whereas the second questionnaire will be sent to a wider range of audience. Since the topic of radioactive is quite sensitive, we spent time considering the information provided in each question and ensure all the answer choices are appropriate for every possible participant of our questionnaire. After receiving enough responses from the first questionnaire, we started analyzing the choices made by the respondents to find out why he/she has chosen that particular option.

Based on the reflections from the first questionnaire and midterm presentation, we constructed the second questionnaire with improvements. We kept a few questions from the first questionnaire which had given us positive feedback and edited/removed those which was not very helpful. Furthermore, we added questions with the explicit implication of identifying the public's general understanding and concerns based on two major investigations, 1) public and political considerations, and 2) scientific-technical issues, which could better fit our objective of this project. Similar to the first result analysis, we group up each choice made by the respondents in the second questionnaire and provide explanations for each group. From the analysis, we concluded that more than 60% of the respondents have limited understanding of high-level radioactive waste, the organizations of nuclear energy should provide information with educating purpose to the general public to fill up the knowledge gap and avoid misconceptions in dealing with high-level radioactive waste.

Since our project involves question designing and result analysis, my main role was just like other group members, which was to brainstorm ideas on the type of questions to be given to the public in order to obtain the necessary information to support the objective of our project. Before the second questionnaire was sent out, I and 2 other group members worked together with our professor in finalizing the questions for English version. After getting the results from the questionnaire, the whole group worked together in identifying the possible trend of choices from the result of the two questionnaires and I took the role in analyzing the results from the English version of the second questionnaire while those who are bilingual focused on both the Japanese and English version.

For the midterm presentation, I was assigned to present the material section, which I needed to explain the results we obtained for the questions relating to the type of material that is the most suitable for the storing of high-level radioactive waste. Not surprisingly, all the questions from the other groups were material-related, which means the section about the material is the most intriguing topic and caught the most attention. The same happens to the final presentation where more questions were asked on the material section of the presentation. For the final presentation, I volunteered to present the introduction and objective of our project, and it was much harder than I thought. Since each group was given 10 minutes to present, I have only roughly 2 minutes to explain the background of high-level radioactive waste and the objective of the project, while the same section took a total of 4 minutes in the midterm presentation.

Although this was the first time I worked with my classmates from the same major as a group, I tried my best to remove any barriers between each of us. Despite the amount of time spent together during the classes was not plenty enough, I always try to give my opinion and thoughts both during the meeting each week and outside in the line group we made. Furthermore, I participated in answering questions from other groups without being shy or having concerns because I know my group members will support and add-on to what I said if some information is missing.

I believe one of the most important aspects of the series of workshops is about teamwork and collaboration, which is also the reason why the students are in groups of 5 or 6 and not in individuals or groups of 2 only. What I learned from the workshops is not only about the knowledge of high-level radioactive waste, but moreover, I learned how to support my group members and work together with them at the same pace. The question designing part of the project required brainstorming and considerations in all forms (political, emotional, etc.) due to the sensitivity of the topic, and this is when collaborations between the group members, TA, and facilitator become extremely critical. Each of us gives our personal opinion and comes together to decide on the final layout of the questions, during this stage, we learned how to design questions with reference to an explicit objective while taking the sensitive information into consideration.

One possible improvement for our project can be using another type of communication. Due to time constraints, we were not able to contrast an interview to some of the respondents of the questionnaire, by having an interview can also be helpful in understanding the public's concerns and level of knowledge on the high-level radioactive waste. In my opinion, we can have the second questionnaire as an interview while the first questionnaire could be sent to a wider range of public.

[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. Rubric Definition

The rubric for evaluating the student's reflection essay will consist of three main criteria, each with a maximum of 10 points, summing up to a total of 30 points. The criteria are:

a. Content and Clarity (10 Points)

- Project Description (4 Points): Clear, detailed, and comprehensive description of the project, including title, goal, and conclusion.
- Design Thinking Application (3 Points): Explanation of how design thinking methods were applied in the project.
- Structure and Coherence (3 Points): Overall organization, flow, and coherence of the essay.

b. Personal Contribution and Role (10 Points)

- Role Description (3 Points): Clear explanation of the student's specific role in the project.
- Contribution Detailing (4 Points): Detailed description of the student's unique contributions.
- Collaboration and Teamwork (3 Points): Reflection on teamwork, collaboration, and interaction with group members and others.

c. Reflective Analysis (10 Points)

- Learning and Insights (4 Points): Depth of learning and insights gained from the workshops, both professionally and personally.
- Self-Evaluation (3 Points): Reflection on personal performance and contributions.
- Improvement and Future Application (3 Points): Suggestions for project improvement and potential applications of the learning in future scenarios.

2. Theory Behind the Rubric

The rationale for this rubric is grounded in educational theory and best practices for evaluating reflective essays:

- Bloom's Taxonomy: The rubric aligns with Bloom's higher-order thinking skills, including application (applying design thinking), analysis (reflective analysis), and synthesis (combining insights and learnings).
- Reflective Practice Theory: This theory emphasizes the importance of reflection in learning. The rubric measures the depth and breadth of the student's reflective process.
- Experiential Learning Theory: This focuses on the cycle of experiencing, reflecting, thinking, and acting. The rubric assesses how well the student has engaged with this cycle.

3. Evaluation of the Student's Essay

a. Content and Clarity: 7/10

- Project Description: The essay provides a clear description but lacks some detail in goal and conclusion (3/4).
- Design Thinking Application: Design thinking application is mentioned but not deeply explained (2/3).
- Structure and Coherence: The essay is well-structured and coherent (2/3).

b. Personal Contribution and Role: 8/10

- Role Description: The student's role is well-described (3/3).
- Contribution Detailing: Good detailing of contributions, but could be more specific (3/4).
- Collaboration and Teamwork: Demonstrates effective teamwork and collaboration (2/3).

c. Reflective Analysis: 7/10

- Learning and Insights: Shows learning and insights, but could delve deeper into personal and professional growth (3/4).
- Self-Evaluation: Adequate self-reflection, but lacks depth (2/3).
- Improvement and Future Application: Good suggestions for improvement but limited discussion on future applications (2/3).

Total Score: 22/30

4. Reasoning for the Given Points

- Content and Clarity: The student provided a good description of the project but could improve in articulating the design thinking process and goals more explicitly. The essay was overall well-structured and easy to follow.
- Personal Contribution and Role: The student clearly articulated their role and contributions, showing a good understanding of their part in the project. They reflected effectively on collaboration, though more depth in describing how they engaged with the team could enhance this section.
- Reflective Analysis: The student showed a good level of reflective thinking, particularly in learning and insights. However, deeper introspection and more detailed future application of the learned skills and knowledge could strengthen this area.

This evaluation reflects the student's strong points in describing their project and contributions, with areas for improvement in deeper reflection and detailed application of design thinking principles.