

Student Essay Evaluation: Competency Check

November 17, 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]

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 ESSAY]

Scoring of students' essays should be done based on the following rubric.

[SCORING RUBRIC]

Comprehensive Evaluation of Workshop Course (Total: 30 Points)

1. Technical Knowledge and Application (10 Points)

- 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 (10 Points)

- 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 (10 Points)

- 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.

Performance Levels and Point Allocation:

- Outstanding (10 Points): The student not only fulfills but also significantly surpasses all set criteria. Their work demonstrates exceptional understanding, creativity, teamwork, and introspection. They exhibit mastery in applying theoretical knowledge to practical scenarios and show remarkable initiative and innovation.
- Highly Competent (8 Points): The student consistently meets all expectations and often goes beyond them. Their work reflects a thorough understanding and application of concepts, effective collaboration, and thoughtful reflection. They demonstrate a strong ability to integrate knowledge with practical skills and show considerable proficiency in problem-solving and innovation.
- Competent (6 Points): The student meets the standard expectations in all evaluated areas. Their work shows adequacy in understanding and applying concepts, collaborating with the team, and

reflective thinking. While they demonstrate basic competency, there may be a need for further development in depth, consistency, or innovation.

- **Needs Improvement (4 Points):** The student's work falls short of meeting the standard expectations in several key areas. There is a noticeable lack of depth or understanding in technical application, collaboration skills, or reflective thinking. This level indicates that the student needs considerable improvement and guidance to reach the expected level of competency.

Application:

Each main item in the rubric is worth up to 10 points, making the total possible score 30 points. The students' performance in each area is assessed against the four performance levels: Outstanding=10 Points, Highly Competent=8 Points, Competent=6 Points, and Needs Improvement=4 Points, accordingly. This approach ensures a comprehensive and nuanced evaluation of the students' work, reflecting their technical abilities, teamwork skills, and personal growth through the workshop course.
[END of SCORING RUBRIC]

Use the rubric to evaluate the student's reflection essay above on a scale of 30 points. Perform Holistic Scoring for each main item. This approach treats each main item (Technical Knowledge and Application, Teamwork and Collaborative Skills, Reflective Learning and Personal Growth) as a whole, evaluating the student's overall performance in that area. In Holistic Scoring, the three subitems for each main item serve as critical guiding parameters rather than direct scoring elements.

To evaluate the student's reflection essay based on the provided scoring rubric, we will assess each of the three main items holistically, considering the subitems as guiding parameters.

1. Technical Knowledge and Application (10 Points)

- **Understanding of Concepts:** The student demonstrates an understanding of the project's aim to design questionnaires for understanding public perception of high-level radioactive waste disposal. The concept of public opinion analysis is clear, but there is limited technical detail on the disposal of high-level radioactive waste itself.
- **Practical Application:** The student effectively applied their knowledge in designing and analyzing two questionnaires. This shows practical application of their understanding in a real-world context.
- **Innovation and Problem Solving:** The student's approach to problem-solving through questionnaire design is innovative, particularly in understanding public acceptance. However, more creative solutions or in-depth problem analysis could have been presented.

Score: Competent (6 Points)

The student meets the standard expectations, demonstrating understanding and practical application but could benefit from more depth in technical innovation.

2. Teamwork and Collaborative Skills (10 Points)

- **Individual Role and Contribution:** The student clearly identifies their role as an idea giver, analyzer, and translator, showing a good understanding of their contribution to the project.
- **Team Interaction and Communication:** While the student mentions their role in the team, there's limited detail on their interaction or communication with team members.

- Peer Engagement: The student does not provide much information on engaging with peers or contributing to team dynamics beyond their specific roles.

Score: Needs Improvement (4 Points)

The student's work shows a clear individual role but lacks detail on broader team interaction and peer engagement, indicating a need for improvement in collaborative skills.

3. Reflective Learning and Personal Growth (10 Points)

- Self-Reflection and Insights: The student reflects on the importance of sharing ideas in a team setting and the learning process, showing good self-awareness and insight.
- Design Thinking and Process: The student discusses the process of questionnaire design, demonstrating an understanding of design thinking, but could provide more detail on managing the project process.
- Skill and Attitude Development: The essay shows some development in professional skills like idea generation and analysis but lacks detail on soft skills development like adaptability and communication.

Score: Competent (6 Points)

The student demonstrates adequate self-reflection and understanding of the design process, meeting the standard expectations with room for further development.

Total Score: 16 Points

The student's essay shows competency in technical knowledge and reflective learning but needs improvement in teamwork and collaborative skills. The overall score reflects a balance between their strengths in individual contributions and the need for more emphasis on team dynamics and broader skill development.