1 Phase 2: Individual Reflection

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1.1 Introduction

Engaging in the design project in phase 2 in a collaborative multidisciplinary team of 8 students with Engineering and Arts and Science Background and employing the foundational learning concepts covered in praxis I and II allowed me to develop my design thinking skills and improve my understanding of the design framework that I can continue to pursue and develop beyond the classroom experience. This reflection will explicitly address prompt 1 focusing on the assumptions that influence my design contributions and design work.

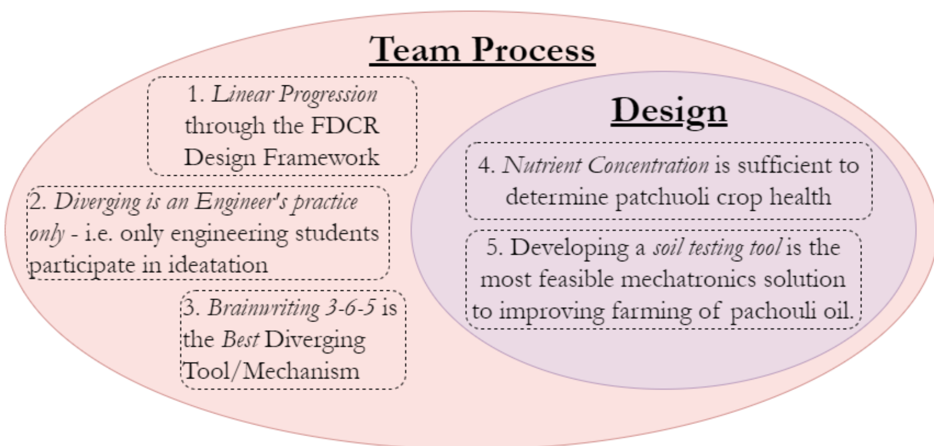

Figure 1: Venn Diagram outlining the key assumptions in the design and team process. I chose this representation because I feel that ultimately the assumptions made during our team process propagated through our design decisions and impacted our final design. As such assumptions in our design in are a subset of assumptions formulated in the team process. *Note: It is important to acknowledge that these assumptions are a small spectrum of the biases and assumptions in the entire project, however these were the most significant and impactful to me as an engineering designer.*

The venn diagram (refer to figure 1) presents an overview the key assumptions that I observed during Phase 2. This individual reflection describes the formative assumptions listed in the diagram above that were conducive to both our design work & team process and acknowledges the challenges that I encountered both individually and collaboratively as a consequence of these assumptions. Strategies to minimize their impact in future are also proposed.

1.2 Major Assumptions in Team Process

1.2.1 Linear Progression through the FDCR Design framework

FDCR serves as a design thinking model encompassing framing, diverging, converging, and representing. In phase 2 of Praxis II, aimed at crafting a soil testing tool for enhancing patchouli farming quality, I operated under the assumption that FDCR follows a linear trajectory, at least due to the time constraints. This led me from framing the opportunity directly tl conducting contextual stakeholder research, then diverging into design ideas and converging onto solutions. However, this approach neglected the iterative nature of the process. I didn't use an iterative approach going back and forth through this design framework. Adopting a more iterative method, characterized by continuous refinement, exploration, and adaptation, is crucial. It fosters comprehensive exploration, mitigates premature convergence risks, enhances flexibility, encourages stakeholder engagement, and nurtures creativity and innovation throughout the design journey. To mitigate the impact of the assumption I need to shift my approach towards a more iterative process that allows for frequent feedback loops, exploration of multiple ideas, and continuous refinement of solutions. This entails revisiting earlier stages of the design process as new insights emerge. I think I can also correct this by having a great stakeholder input at every stage of the design process, by doing more contextual research regarding the farmers working environment to the pre-processing of patchouli, from framing the opportunity to representing the final solution. Also like previous praxis 1 and 2 project, soliciting stakeholder feedback, insights, and perspectives to ensure that the design adequately addresses their needs and concerns was essential and I feel that not having a first degree connection with the stakeholders also impact our design pool, as we incorporated many assumptions regarding the farmers working conditions and concerns without first degree verification.

1.2.2 Diverging is an Engineer's practice only

I primarily noticed that the Arts and Science students were not given much opportunity to innovate and contribute to the diverging process (seen in figure 2 all contributions of design ideas are by praxis students only). I personally felt that our process of distributing tasks and allocating work assumed that only engineering students contribute to the design pool and generation of design ideas. As such, this assumption yielded lack of inclusiveness for the non-engineering students and our design pool lacked diversity. I think this assumption propagated through our design work because of prior Praxis I and II team projects and other design teams (like UTWind and UTAT) which are concentrated with strictly EngSci students and engineering students respectively. Additionally this bias in our engineering practice was also nurtured by the fact that only us EngSci's were familiar with the FDCR model and DfX principles. Therefore whilst communicating with my group members including Arts and Sci students, I often incorporated more engineering vocabulary sometimes neglecting the fact the Arts and Science student may not comprehend or understand those concepts. As such there was a lot of miscommunication and lack of understanding and common grounds. This had a significant impact on our team dynamics and team harmony,

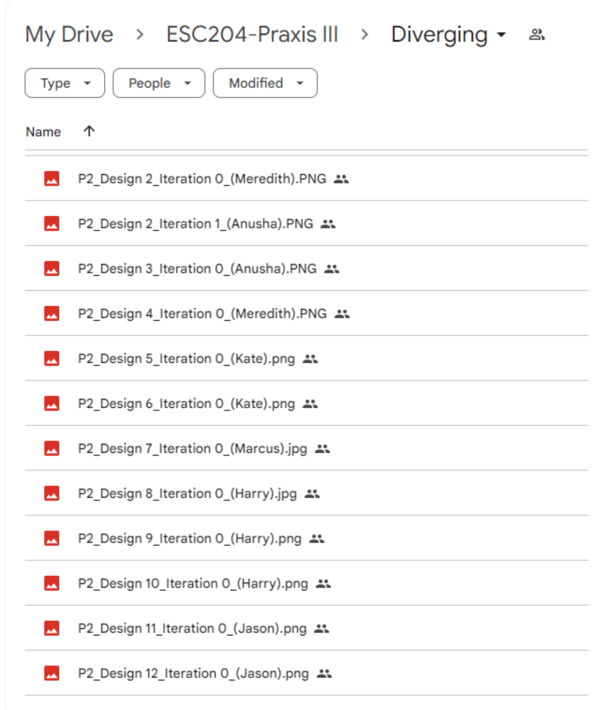

Figure 2: Screenshot of Diverging folder from design dossier where all design concept contributions are primarily from praxis III students. Limited to no participation from Arts and Science students.

because Arts and Science students may have felt left out and lacked tangible contributions to design process. Recognizing the value of diverse skills and perspectives in innovation, we must reassess task distribution and allocate work based on individual strengths rather than assumptions about academic background. Actively involving all team members in discussions and decision-making fosters inclusivity, while providing training and resources ensures equal opportunity for participation. Improving communication by using inclusive language and celebrating the diverse contributions of all team members to the design process creates a more collaborative and inclusive team dynamic.

1.2.3 Brainwriting 3-6-5 is the Best Diverging Mechanism

From prior experiences like Praxis I and II and Alpha and Beta release, I had developed a preference/bias to using 'Brainwriting 3-6-5' as an important diverging tool. For example in the prior experience of diverging in praxis I for solving the alarm clock opportunity I was able to overcome functional fixedness and cognitive bias to prevent the ideas of revolving around the initial idea, allowing my team to gather a diverse range of ideas including some bizarre ones. However this bias persisted in my current work. As such I kept encouraging my group to use this diverging tool because I assumed that this would yield the best results. However I have now come to the realization that this was not best and the most fruitful diverging tool because there are potential for redundancy of ideas and generation of bizarre, meaningless ideas that are useless and unfeasible for the scope of patchouli oil design project. As such for the remaining phase 3 of praxis III, my goal is to eliminate this assumption and be more open to other diverging tools like Lotus Blossom and Morph charts (suggested by my other group members) to have more diversity in design concepts and wide range of consideration of technical aspects like battery operation, probe movement, insertion and submergement of the probe in the soil. Incorporating these diverging tools can be more fruitful in our consideration of the unique prototyping aspects and development plan.

1.3 Design Assumptions

1.3.1 Sensors for testing nutrient concentration

For the preliminary design, I was delegated to find the sensors required for testing the soil nutrients for the patchouli farming land space. Whilst finding the sensors I assumed that only nutrient concentration sensors were necessary for determining the health of the crop. My assumption that only nutrient concentration sensors are sufficient for assessing soil health for patchouli farming land overlooks the complexity of soil dynamics, potentially resulting in a narrow and incomplete assessment which defeats the purpose of solving this opportunity space. This limitation may lead to ineffective management strategies, missed opportunities for incorporating valuable insights from other sensor types, reduced adaptability to changing soil conditions, and ultimately, suboptimal crop growth and yields. To correct this assumption, a strategy I should probably implement is to conduct more preliminary research rather than relying on prior knowledge that may render insufficient for the scope of such an engineering design project. This can allow me take extract design considerations into account as an engineering designer and cater better solutions to the needs of the stakeholder.

1.4 Soil Testing is the only viable solution

While initially assuming that developing a soil testing tool is the most feasible mechatronics solution for improving farming of patchouli oil, it's essential for me to recognize the potential limitations of this assumption. While such a tool may offer valuable insights, its high cost, complexity, and limited accessibility could pose challenges, particularly for small-scale farmers. Thus, it's crucial to remain open to alternative solutions, such as leveraging generative AI and image capture technologies, which may offer advantages in terms of cost-effectiveness, scalability, real-time analysis, and accessibility. Whilst diverging I noticed myself continuously revolving around soil sampling tools and sensors which although are feasible ideas, I formed a bias and preference for these ideas, ignoring the other spectrum of solutions that exist within this design frame that are also equivalently viable. Embracing a diverse range of ideas and complexities is essential for ensuring inclusive and effective strategies to enhance patchouli oil farming practices.

1.5 Conclusion

After examining the above assumptions in my current project that were partly driven from my old praxis I and II design experiences and partly because of my lack of acknowledgement of design aspects, I have came to realize how they shape and limit the scope of my team process and design work. As such by reflecting on strategies on how to mitigate the impact of these assumptions I have become a more enclusive engineering design and will ensure to incorporate these strategies in phase 3 of praxis and my future project of Hack the globe, global sparks competition in leveraging IoT to improving access to health care in remote countries. I will ensure that these biases and assumptions are mitigated from my design work and diverging practic in Hack the Globe and phase 3 and I transform into a better and more inclusive engineering designer.