REFLECTION IN ENGINEERING EDUCATION: FROM AFTERTHOUGHT TO CONTEXT SPECIFIC

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OVERVIEW OF WORKSHOP

The wicked challenges we face today require engineers to be social, ethical, and environmentally responsible, be context-aware and to interact with stakeholders that vary in occupations and positions in society.
This requires professional skills, such as teamworking, empathy, and ethical perspective and responsibility. In the core of those skills, we find *reflection*. Imagine what would take to acquire those without the ability to reflect?
Unfortunately, reflection itself is hard to grasp, teach and apply (Chan & Lee, 2021). For starters, *reflection* has many definitions and a variety of benefits attributed to it (Marshall, 2019; Schaepkens & Lijster, 2022). Additionally, there are multiple domains to reflect on: Society, Process, Product, Collaboration, Learning process, and Yourself (P.Hermsen, 2022). Depending on the person and context involved, the role and application of reflection vary. Moreover, our university-wide exploration shows that reflection is susceptible to *couleur locale*: the adoption and use of reflection is under the influence of local culture, habits, conditions, etc. (P. Hermsen, 2022). In short: reflection resists systematization and cannot be learned following rules and protocols (Schaepkens & Lijster, 2022), but by seeing connections and understanding patterns. That conflicts with traditional Engineering practice, which is characterized by strongly relying upon systematization, well-structured problem-solving and scientific paradigms (Lönngren, J. 2017). Perhaps that explains why the role of reflection in engineering education has been usually shaped as an assignment, a written report, following a reflective model, or structured instruction. These reflective assignments are frequently superficial and filled with socially desirable answers.

In this workshop, participants will explore ambiguity and complexity of reflection in engineering education and discuss the challenges in learning and teaching this core skill. After that, we will explore how local contexts (conditions set by institutes and educational programs, people doing the work, and so forth) affect the (un)successful embedding of reflective behavior. Lastly, we will introduce and use a framework for navigating these hurdles toward successfully integrating reflection into engineering education.

KEYWORDS

Reflection, ambiguity, embedding, systematization, contextualization. Standards: 3, 4, 7, 9

DURATION

60 minutes

ACTIVITIES

The workshop starts with a brief introduction of participants and facilitators. After that, in consecutive order:

1. All participants actively reflect on the role of reflection in their teaching and work context. By sharing those thoughts, we explore the wide scope and definition of reflection and become aware of its ambiguity and nuance.
2. By clustering our input, we identify patterns and gaps in how we use reflection in our current educational practice.
3. Next, we look at how we ideally envision the role of reflection in current and future (smart, safe, and sustainable) education.
4. Together we acknowledge and discuss the difficulties of using reflection in engineering education regarding our previously defined vision.
5. In small groups, we classify these difficulties in a framework based on the eco-normalization model by Hamza and Regehr. (Hamza & Regehr, 2021). By doing this, it becomes apparent that depending on classification, different causes and solutions emerge.
6. Participants examine the difficulties they deal with in their own contexts and discuss possible solutions.
7. The facilitators share highlights of our practice: a university wide program to incorporate reflection in disciplinary education, including both the difficulties and solutions. Our aim is to (hopefully) be inspirational for participants.

TARGET AUDIENCE

Relevant for anyone interested in reflection and involved in (developing or innovating) education. No background knowledge, nor pre-workshop preparation required.

OUTCOMES

- Participants will gain insights in the role of reflection in their own educational contexts and (possible) reflection gaps.
- Participants will become aware of the multiple domains of reflection, and the relevance of reflection on these domains in relation to their own context.
- Participants will define how they ideally envision the role of reflection regarding their context.
- Participants will gain better understanding of difficulties present in their educational context by using reflection in the envisioned way.
- Participants will navigate these difficulties and discuss possible strategies and solutions to successfully implement reflection in education.

SPECIAL REQUIREMENTS

We require an open, flexible space and individual seats that can be moved around, to enable people to move around the room and to easily switch between standing, walking, and sitting. One of the walls should preferably be a white board, or otherwise a big usable vertical workspace otherwise. We can discuss non-intrusive and non-destructive use of plain walls (we have experience with that). We need at least an hour before the session to prepare the room.

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BIOGRAPHICAL INFORMATION

***Pleun Hermsen*, MSc, MD** is Program Director of the interfaculty Reflective Engineer Program at Delft University of Technology. She is an education-system innovator and educational designer. Combining the different fields of her background and her desire to learn continuously, she is passionately working on embedding reflection as a core competence by – in co-creation - designing meaningful, viable and long-lasting educational innovations that are tailor made for specific contexts.

Sjoerd van Dommelen MSc. is closely involved with the TU Delft interfaculty program Reflective Engineer and has a lecturer position at Industrial Design Engineering TU Delft. He is also recognised as Education Fellow of the TU Delft. He has experience in both participating and leading roles in teaching and the innovation of education, within individual courses, learning lines, curricula, and interfaculty initiatives. He has an interest for professional development and for reflection (and in particularly empathic abilities).

Paula Hueso Espinosa MSc is a researcher and education developer at Delft University of Technology (TU Delft). She is currently an educational designer in the Reflective Engineer program. Her research focuses on resilience and how to facilitate students' self-development. Her interests rely on social design, psychology, and human behaviour.

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