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Reflection in Engineering Education

White paper '100 DAYS OF… REFLECTION'

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Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Reflection in Engineering Education

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A white paper of 100 DAYS OF *REFLECTION* Organised by

4TU.CEE

Centre for Education and Learning
Leiden-Delft-Erasmus Universities

TUDelft | Teaching & Learning Services

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Reflection in Engineering Education

Reflection is a term often heard. But what is actually meant by it
in the context of engineering education? How do we see reflection
being applied in engineering, and where? To what could it
contribute? And what are challenges involved?
In 100 days, 'Reflection in Engineering Education'
has been explored through journal clubs, conversations,
presentations, a case pitching workshop, and peer
exchange among scientific staff and educational support.
This paper outlines this exploration with the aim of
making reflection more accessible and concrete within
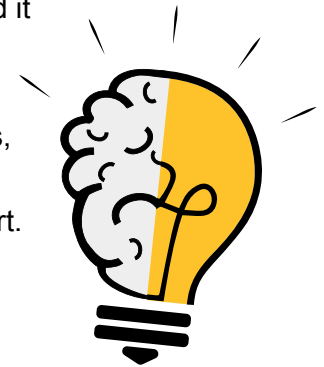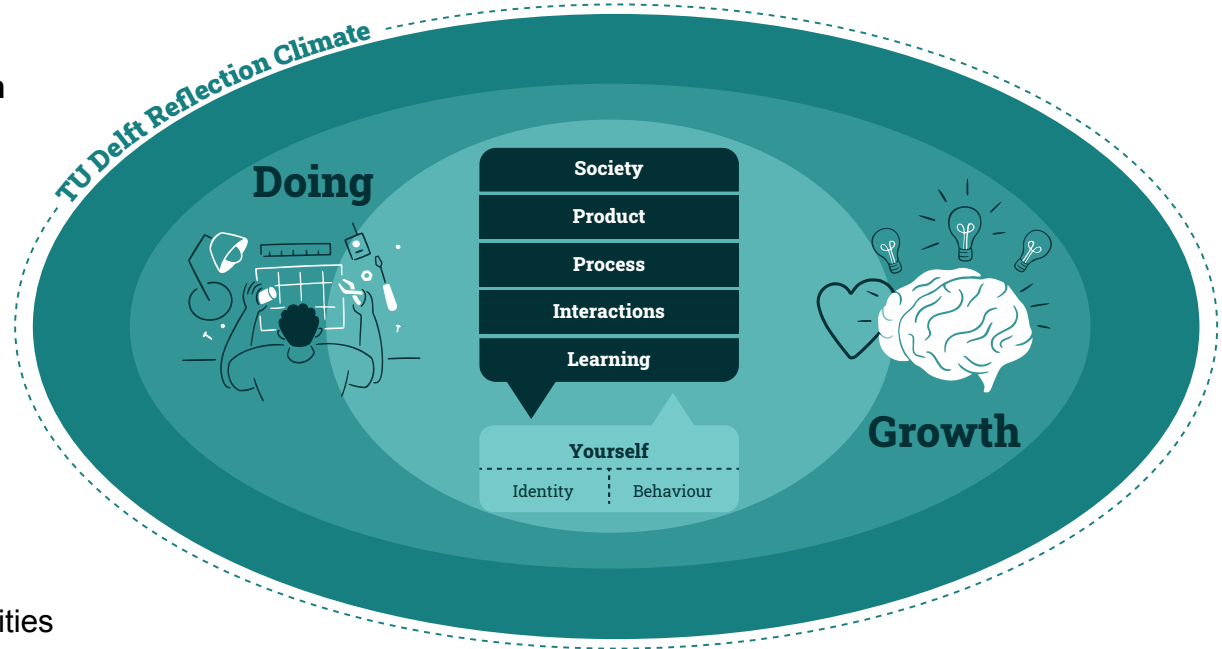the context of TU Delft Engineering Education.

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"Reflection is a process in which people make sense of and interpret a specific experience to yield insight into where they stand and how to go on."

The broad scope of reflection in engineering education

Reflection is a term often found in the educational world but what do we really mean by it in the context of our BSc and MSc Engineering programmes? Where is reflection applied in the courses at TU Delft, what can it contribute and what educational challenges does it entail?

During approximately 100 days, we explored 'Reflection in Engineering Education' based on papers, journal clubs, education conversations, presentations, workshops and exchanges between our scientific and support staff (see appendices 1, 2 and 3).

Reflection is a process in which people make sense of and interpret a specific experience to yield insight into where they stand and how to go on. Reflection has to do with giving meaning to and enabling deeper learning from any such experience. Reflection facilitates learning.

A search of the literature on this topic yields a multitude of definitions, reflection forms, reflection activities, reflection functions and synonyms of reflection or similar concepts, coming from a variety of contexts. But even within a more homogeneous context, such as TU Delft, people interpret the word 'reflection' and the relationship between reflection and the study or an engineer's work differently.

So, we did not use the '100 DAYS OF… REFLECTION' programme to go looking for the 'correct' definition of reflection at TU Delft. We did, however, come to realise how broad it is. We would therefore like to show the broadness of this scope by presenting our exploration in this paper. Our objective is to make reflection a more accessible and more concrete concept in the context of the engineering education at TU Delft. We also describe some of the questions and issues that will arise if we are to give reflection a place in the curriculum.

"Reflection is not an activity in itself; it is a means, not an end. After all, you reflect on something."

Six reflection domains: Society, Product, Process, Interactions, Learning, Yourself.

Reflection is not an activity in itself; it is a means, not an end. After all, you reflect on something. We differentiate between six domains on which we can reflect.

We differentiate between domains, but we do so to facilitate discussion rather than separate or isolate them. In practice, the domains are often interwoven with one another and overlap to a certain extent or cannot be seen in separation of other domains, in the case of the domain 'Yourself'.

• Society
• Product
• Process
• Interactions (e.g collaboration)
• Learning
• Yourself (in which Identity and Behaviour can be identified)

Society

Major social themes, such as climate change, inclusion and equity, affordable healthcare, sustainable infrastructure and mobility, the energy transition and a circular economy, are important topics for engineers. Even if engineers do not actually want to work on themes of this kind, they will still have to relate to them. Responsible engineers will reflect on ethical and social dilemmas and how technical and technological developments and their own work will impact society. Reflection on complex social themes sets the standard for professionals and compels engineers-in-training (and our team of lecturers!) not just to accept simplification without examining things more carefully.

Fleck & Fitzpatrick, 2010; Turns et al., 2014; Xu et al., 2021

Product

Engineers develop products, models, prototypes, policies, procedures and/or services. Reflection on the various stages of this product, model, procedure etc. may, for example, involve weighing of requirements of proposed design and balancing that with other (e.g social or environmental) concerns. Or it may involve the value and limitations of a developed technology. It may also involve questioning whether the intended final result is a real solution to the original problem. Critical or academic reflection on the engineer's own research results and conclusions is another example of this type of reflection.

Edwards, 2017; Fleck & Fitzpatrick, 2010; Turns et al., 2014; Diefes-Dux & Cruz Castro, 2022; Harlim & Belski, 2013

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Interaction (e.g. collaboration)

Engineers do not work in isolation; they work in an interdisciplinary manner with colleagues and stakeholders from different sectors, backgrounds and training programmes. Learning how to reflect on interactions and collaboration with peers or supervisors gives students insight, experience and the vocabulary they need to truly understand others, collaborate constructively, and prevent, manage and solve conflicts. Reflection on interactions also enables individuals to open up to different outlooks and widen their perspectives.

Brooks et al., 2019; Fleck & Fitzpatrick, 2010; Hirsch & McKenna, 2008; Keestra, 2017; Turns et al., 2014

Learning

As a child, you learn to walk without thinking about it. As a young adult, acquiring new knowledge or learning new behaviour is less automatic. As an engineer, you have to *learn to learn*; after all, technology and technological know-how change and become obsolete increasingly rapidly and we cannot possibly train engineers specifically for every potential field of their future careers. What is more, many engineering jobs of the future do not yet exist and, thus far, we are not even aware of what they may involve. Awareness of students' own learning strategies, behaviours, attitudes, values, ambitions, personal targets and motivation therefore gives them added value. It gives them the means to take responsibility and show ownership of their own training and personal development, during and after their studies.

Ossa Parra et al., 2015; Merriënboer & Bruin, 2019

Process

In the process of aforementioned products, models, prototypes, etc., multiple conscious and subconscious choices are made. Reflection on this process may involve going over the steps or activities, even if everything is going well. It may also involve exploring possible blind spots, looking for assumptions, biases and searching for fallacies or frequently made mistakes. This can be done during the process and afterwards. Critical or academic reflection on the engineer's own research methods is another example of this type of reflection.

Edwards, 2017; Fleck & Fitzpatrick, 2010; Turns et al., 2014; Diefes-Dux & Cruz Castro, 2022; Harlim & Belski, 2013

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Yourself

You yourself are central to your reflection regardless of the form concerned. We are all born and brought up with a personal profile of conscious and unconscious standards, values, convictions, biases and privileges. Experiences widen and deepen your personal profile. Awareness of these matters is a key element in reflection. After all, wherever you go, you take yourself with you. Your profile affects the way you look at the world, how you learn and how you interpret both the world and what you have learned. One individual will interpret a score of '9 out of 10' as an exceptionally good achievement, whereas another will interpret it as 'not good enough' because it is not '10 out of 10'. Your own profile therefore has a direct effect on how you look at other domains, how you experience society, products, processes and interactions (for example, conflict management) and learning. That translates to your behaviour, for example in actions you do or do not take.

Reflection on the six domains is quite separate from whether things are right or wrong and whether targets are being met or not.

These are aspects of *evaluation rather than reflection*. Reflection is all about being aware of how your perspective is affecting your experiences and your views of the domains.
And it is about knowing that everyone brings an own self to the table, all with an own perspective and view, all equally important. If you are aware of this, you can act and cooperate in a more considered, informed manner. (Argyris, 1982; Argyris et al., 1978; Usher & Bryant, 2014)

de la Croix & Veen, 2018; Asselin & Fain, 2013; Brooks et al., 2019; Diefes-Dux & Cruz Castro, 2022; Fleck & Fitzpatrick, 2010; Keestra, 2017; Ossa Parra et al., 2015; Polmear et al., 2020; Takacs, 2003; Tsai & Lau, 2013; Turns et al., 2014

100
DAYS OF
REFLECTION

"We feel that it is important in our engineering education to have students reflect, together with lecturers, on both the work of the engineer and the person behind the engineer."

100 DAYS OF REFLECTION

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Two perspectives: Doing and Growth

In addition to the six domains mentioned above, we also differentiate between two reflection perspectives: an action perspective (Doing) and a formative, contemplative perspective (Growth).

On the one hand, reflection can be very helpful in acquiring more insight into how to produce better products, models, designs, prototypes, services, work processes or procedures; this is what we mean by the action perspective. It has a good fit, intuitively speaking, with the role of an engineer as an analytical problem solver, maker, designer and manufacturer. After all, it is about the work, the products and work processes of the engineer. But besides this, there is also a contemplative perspective that is more formative and humanistic. This perspective helps engineers and engineers-in-training to develop into better professionals. Reflection offers insight into oneself, one's own values and how one relates to the surrounding world. This perspective is therefore about the

engineer as a *person*. We feel that it is important in our engineering education to have students reflect, together with lecturers, on *both* the work of the engineer *and* the person behind the engineer. (Marshall, 2019; Schön, 1983)

The added value of reflection education, with its different perspectives and in its different domains, has been broadly acknowledged in our '100 DAYS OF… REFLECTION' exploration. However, the idea has also emerged that it is easier said than done. Possible reasons may be that it is difficult to tailor reflection assignments to students, especially if these assignments are intended to promote *bildung*. We are also concerned about making

students reflect too much, causing them only to see reflection as an annoying obligation. It is not easy to determine the intended outcome of reflection assignments and measure whether students have done them correctly. A number of questions and issues relating to reflection for engineering students have therefore been described briefly and succinctly in the next segment.

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"Systematically providing explicit reflection, stating its relevance and setting a good example, are a start for creating reflective professionals."

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Education: Design and Teaching

It is not easy to determine the intended outcome of reflection assignments and measure whether students have done them correctly. A number of questions and issues relating to reflection for engineering students are therefore described briefly and succinctly in this chapter.

When is the right time to reflect in education?

Reflection moments have to be created as they rarely occur spontaneously. Besides choosing how you want your students to reflect, that is, in which domains and with which perspectives, you have to use and take into account the existing structure of a course or curriculum. The socially safe introduction (forcing) of a *disruptive moment* in which *constructive friction* arises can be just such a moment. The distinction between *reflection before*, *during* and *after action* can help with the choice of a suitable moment. (Guo, 2022)

(Edwards, 2017; Merriënboer & Bruin, 2019; Turns et al., 2014; Xu et al., 2021)

How often should you reflect?

Teaching reflection only once will have a very limited impact. With reflective activities in a longer timespan, the effect will increase. (Dabbagh & Kitsantas, 2012; Guo, 2022) If reflection is featured in all kinds of ways (in lessons, in courses, in curricula and in the culture) it will have more impact but this will obviously be more difficult to realise. (Hong et al., 2019) Changes in this field, towards a more reflective educational environment, will be a long haul.

(de la Croix & Veen, 2018; Ertmer & Newby, 1996; Luken, 2010; Mann et al., 2009)

Can you reflect too often?

The term 'reflection zombie' describes students who have to reflect so often that they get fed up with it. As a result, they may no longer truly reflect but merely think up socially acceptable answers. A reflection overkill is more likely to be the consequence of repeated reflection assignments that are not really relevant than of too many assignments. Variation in reflection methods and domains and experiencing the relevance of reflection can help to prevent this. At the same time, it is *in itself valuable* to engage in reflection simply as a standard part of our teaching programmes.

(de la Croix & Veen, 2018; Luken, 2010; Poortvliet, 2021)

Does reflection always lead to action?

Making sense and peeling off the layers of a certain experience in order to interpret it and generate insights can lead to action. People can think up slightly different ways of tackling things the next time a similar situation occurs, but they may also be satisfied with the way things are currently being handled and deliberately choose not to alter the approach in a new case. Or perhaps the insight will be that different behaviour is more desirable but that those involved are not able to change their behaviour appreciably at that point in time. Reflection leads to insight. Whether action follows is a conscious or unconscious choice. (Fleck & Fitzpatrick, 2010; WWR, 2017).

What is the best method for reflection?

Various methods and models have been put forward but there is no single 'correct' method for reflection (Edwards, 2017). The contexts wherein a reflection takes place, differ too much. From a philosophical viewpoint it is argued that reflection resists systematization, that it cannot be learned by following rules or protocols, but only by practice. (Schaepkens & Lijster, 2022)
What the most appropriate method is in your context, to practice reflection will depend on the education, the target group, the venue, personal factors, and more. We looked at various examples of how reflection can be put into practice in the '100 DAYS OF… REFLECTION' exploration. Apps, portfolios, gamification, analysing presentations alone or jointly, explaining the process of making mistakes, exercises for identifying gaps in knowledge (by students themselves) and dialogue and review at the end of lectures were all suggested to this end.

de la Croix & Veen, 2018; Turns et al., 2014; Gordijn et al., 2018; Mann et al., 2009;Merriënboer & Bruin, 2019; Ossa Parra et al., 2015

How can I find a suitable method for reflection, in my context?

An understanding of the target group, the objective of the reflection, the venue and personal factors all provide input for the choice of a method. The sources below provide a good start for understanding various methods. Co-creation of the assignments with students (the target group) has added value. (Dollinger et al., 2018) Support in designing and implementing reflection in education at TU Delft can be obtained from the team of the Reflective Engineer.

Gordijn et al., 2018; Mann et al., 2009; Ossa Parra et al., 2015; Turns et al., 2014

How can I encourage students to reflect?

As a lecturer, you can design reflective assignments. Create moments when reflection is relevant, valuable, and seen as necessary, in co-creation with students. In addition to the design, paying attention to social safety, making room for the exchange of ideas about reflection and setting a good example yourself play a significant role in the success of reflection activities. *Peer-to-peer* discussions can be just as effective as feedback on reflection or a discussion with the lecturer.

Beard, 2018; Van Merriënboer et al., 2002; Verpoorten et al., 2011

How do you test reflection?

In the first place, the question is whether you want to test reflection at all! Is reflection a means or an end in education? It is important to be aware of the fact that testing reflection will affect the content of that reflection. After all, reflection is an internal process that is externalised by describing and sharing it. Giving socially desirable answers is one of the filters that students will consciously or unconsciously use if reflection is going to be assessed. Another filter is language.
And what do you assess if you are going to test reflection? Do you assess the degree to which students are able to give socially desirable answers? Or how well they are able to externalise internal reflection? Or their language skills? Or the level of the reflection; is it descriptive or academic, for example? There are no clear answers to the questions of whether one should test reflection and, if so, how. (Schaepkens & Lijster, 2022)

Hargreaves, 2004; Veen et al., 2020; de la Croix & Veen, 2018; Mann et al., 2009

Do students become more reflective outside the educational sphere too?

Students are not automatically going to reflect in their daily lives or in their future job if they have only been exposed to implicit reflection now and again. Systematically providing explicit reflection, stating its relevance and setting a good example, are a start for creating reflective professionals.

(Asselin & Fain, 2013; Bennett-Levy & Padesky, 2014)
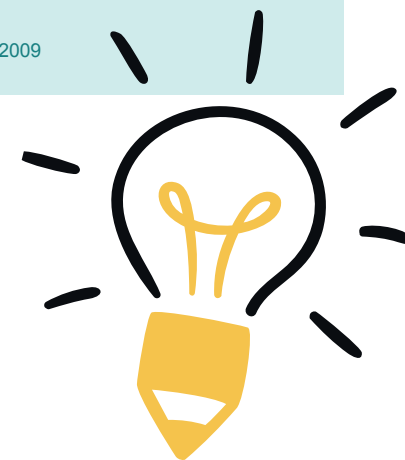
"
The reflection climate is not identical throughout TU Delft but has 'couleur locale'."

Reflection Climate

Context plays an important role in reflection. Context can be supportive of reflection, but it can also hinder reflection. Context also contributes to giving meaning to reflection or acting on it. This chapter deals with several topics related to the reflection climate.

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What is the TU Delft reflection climate like?

The reflection climate is not identical throughout TU Delft but has '*couleur locale*'. Individuals, sections, departments and faculties all have their own interpretation of the concepts reflection, acquired knowledge and experience. Everyone attaches their own value to them. The personal colour and that of the environment have a big impact on how those in education engage in reflection. There are just as many versions of reflection in each team as there are people. Departments and the associated courses and degree programmes also have *colour locale* as a result. Whereas it is normal to discuss mistakes in one department, it is simply *not done in another*. Some see reflection solely as critical reflection on an article while others interpret the term exclusively as self-reflection. Reflection will become more accessible if discussed in the broader sense.

What is the role of social safety in reflection?

Good reflection benefits from social and psychological safety. This has to do with being trusted, daring to speak out freely and being able to voice doubts openly and make mistakes as part of the learning process. Social and psychological safety is related to major social themes such as diversity, inclusion, equality and transgressive behaviour and a specific situation can be experienced differently by one individual than by another. Social safety does not arise automatically. The training of lecturers in social safety and development of social safety in the organisation in general are points of particular interest.
(Cotton, 2001; Mann et al., 2009)

Don't you expose your weaknesses and flaws too much if you reflect?

If we view reflection as an essential part of the learning process, it is helpful if we make room for students (and lecturers) to show their vulnerability in this way. Normalizing vulnerability or sharing failures and lessons learned adds value. In project-based education, it can help to mainstream making mistakes and learning from them. (Jackson et al., 2021; Tawfik et al., 2015).

(Cotton, 2001; Jordan, 1997; Kennedy, 1962; McKenna et al., 2009; Ossa Parra et al., 2015; Veen et al., 2020)

How do we normalise reflection?

Practice what you preach. If we want students to reflect, we should set a good example. Lecturers who share their thoughts out loud on the decisions they make in their work (education/research) create room for new perspectives, underwrite the relevance of reflection and normalise it. Many scientists at TU Delft have only built up limited know-how and skills in the field of reflection during their engineering education. They are, however, expected to engage in it. Does TU Delft's lecturer professionalisation programme focus sufficiently on this?

(McKenna et al., 2009)

Is reflection culturally determined?

Cultures vary in different ways. In her book, *The culture map: decoding how people think, lead and get things done across cultures*, Erin Meyer describes various work-related attitudes and behaviours that vary according to culture (Meyer, 2016). It is likely that the way in which people practice reflection and how the different domains are viewed, differ between cultures. (See also: What influence do language, and the working language, have on reflection?)

(Hilary Brown, 2016; Tsai & Lau, 2013)

What influence do language and vocabulary have on reflection?

Reflection is often a linguistic assignment. If reflection takes place in a language other than the student's native language, this will complicate matters. Reflection requires nuances and therefore an adequate vocabulary, including emotional terminology. Students do not necessarily have this vocabulary ready and available to use. The provision or development of this vocabulary should therefore be taken into account. Furthermore, the development of reflection assignments that are less linguistically oriented is also needed, particularly for engineers. (See also 'Is reflection culturally determined?')
(Bell & Attardo, 2010; Narain, 1991; Turns et al., 2014)
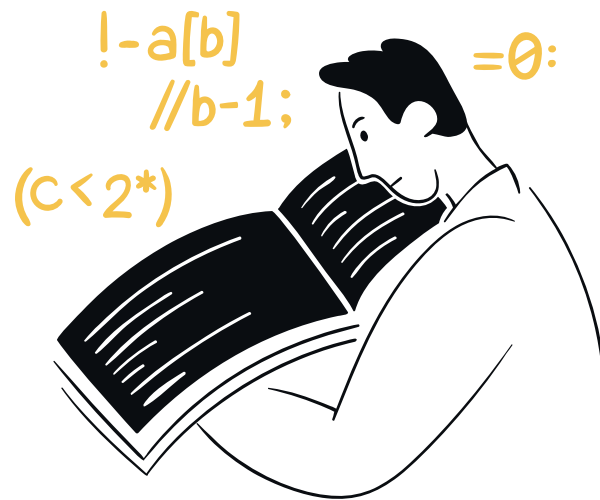
Do you reflect alone or with others?

Having different perspectives or lenses through which to look at situations or experiences broadens your scope and insight. (Guo, 2022; Turkle, 2011) Reflection during dialogue provides an opportunity to exchange perspectives, increase one's know-how by sharing in the other party's knowledge and discover knowledge neither party is yet aware of. Development and growth take place on this basis (Luft & Ingham, 1955). Making time for such discussions is a challenge, particularly because they are not usually urgent; they are, however, important. You can examine other perspectives alone too. Reading books, listening to stories and podcasts and watching films, etc., in which you get to know people in comparable or different situations can also lead to new insights. This may sometimes help you to see the similarities and differences between situations in internal dialogues.
(Turns et al., 2014)
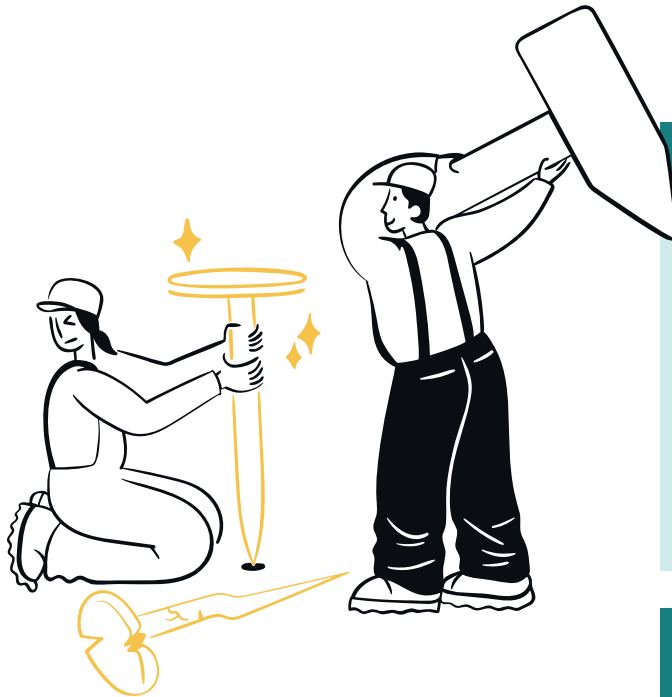
I find reflection awkward, why should I engage in it?

Reflection is a mirror that can confront and disrupt. This awkwardness and awareness of the emotions involved are associated with impactful learning and transformation. You need autonomy to be able to decide whether you want to face the confrontation but, at the same time, you need the stimulus and room to simply go ahead and do it regardless. You have to work at tolerating the awkwardness; it does not just go away on its own. It is important to name the awkwardness, emphasize its usefulness, explain the reflection process and provide the room needed to indicate one's boundaries.

(Dirkx, 2001, 2006; Immordino-Yang & Damasio, 2007; Mezirow, 1978, 2000)

Do people have prejudices about reflection?

Reflection has a broad scope and often only a few reflection domains are taken into account. And we all know that *unknown is unloved*. There will therefore always be prejudice. So what can we do about it? Experiencing reflection in new domains can be a good start to better accessibility. It can, for example, expand one's personal reflection toolbox.

(Harlim & Belski, 2013)

How does reflection relate to diversity, inclusion and equality?

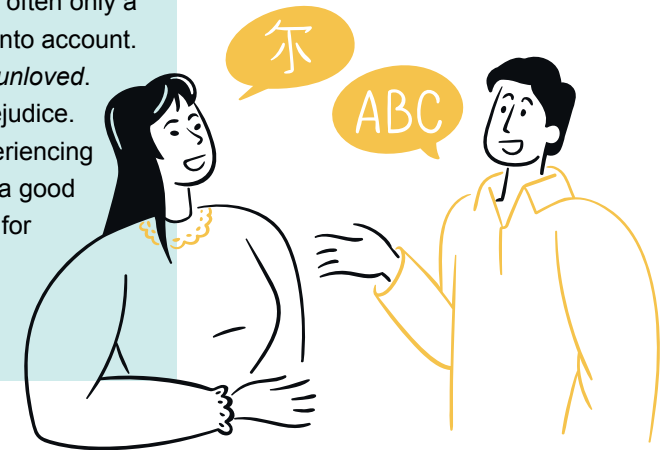There is work to do in the fields of diversity, inclusion and equality in our education. Reflection is an essential aspect of this: it helps generate awareness of unconscious biases, privileges and their effects and it helps individuals see new perspectives and open up to new behaviour.

(Brooks et al., 2019; Harlim & Belski, 2013; Hilary Brown, 2016; Keestra, 2017; Lindsey et al.)

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If we intend to reflect more, will things come right on their own?

Reflection is valuable but is often skipped. It is more difficult to schedule time, on a structural basis, for something with an unpredictable outcome than to schedule time for something urgent on your to-do list. It demands time and focus to get students to reflect. Reflection tiredness lies in wait for us and is a real risk. Implementing reflection as a structural element of our education requires attention. It is crucial that we make the reflection education element fit into the local context and existing structure so that it is appropriate for the possibilities, resources and people present. (Hamza & Regehr, 2021; Schaepkens & Lijster, 2022)

(Picard et al., 2022; Turns et al., 2014)

What role do tools have in reflection?

Tools, including digital tools, can support reflection in many ways. (Guo, 2022) We mention several below although this is not an exhaustive list. There are, for example, various electronic portfolios that can serve as collection systems for reflection in all domains and that can invite further reflection. There are also apps that promote reflection on the learning process in self-regulated learning (Baars et al., 2022). There are, furthermore, platforms with low-threshold access to electronic coaches that spark off reflection with exercises and chat discussions. A number of online tools are, moreover, available for reflection in the fields of collaboration and process on platforms such as brightspace, Miro, etc. The provision of apps, portfolios and platforms is, however, not the solution in itself. Their use must be part of a larger whole and be perceived as relevant by students. The risk of only offering these electronic aids is that this may be seen as yet another administrative burden.

(Broadbent et al., 2020; Fleck & Fitzpatrick, 2010; Merriënboer & Bruin, 2019; Quintana et al., 2004)

" An important first step and message for lecturers and course or programme coordinators is chiefly to determine for yourself what you want to achieve with reflection. **"**

Call to Action

What can you do to strengthen reflection in Engineering Education?

For lecturers

An important first step and message for lecturers and course or programme coordinators is chiefly to determine for yourself what you want to achieve with reflection (and therefore also what not!). The choice of *topics* on which to reflect (*the what*) and how to reflect on them within your curriculum is vast. You will have to make choices that fit in with the educational context: the programme, the students and the lecturing team. So, our advice is not to do everything (that is not necessary) and not just to do something without good reason (that is a waste of energy). But analyse your own educational context at the course and programme level to determine your needs and the content and structure of your reflection education. Another important objective is to remove lecturers' and students' blind spots. Most people have preconceived ideas about reflection and its value. Give them the entire playing field: the six domains and the Doing and Growth perspectives, so that they can determine their own positions, as students, as lecturers and as course and programme coordinators and decide: what do we do, what not and why? Discuss the situation and consult with one another.

For educational management and policy makers

Both the action perspective and the formative, humanistic perspective should be reflected in all TU Delft engineering programmes because both will contribute to producing engineers with more social impact. But educational innovation processes are stubborn and often require long-term investment. Determining the targets, structure, and integration of reflection education in a programme (including the assignments, learning activities and assessment) does not usually happen overnight. It needs tenacious educational leaders and an (educational) management who give staff members the room to reflect on their own efforts, so that they can learn about *reflective engineering* together.

If we are to integrate reflection into our education, it will take focus and effort and therefore money too. This investment will benefit from top-down encouragement. How do we ensure that reflection is not seen as window dressing but as an integral part of our engineering education? How do we make certain that we practice what we preach and set a good example in our working environment? By recognising, encouraging, and commending the people and groups who show leadership on this theme at various levels at TU Delft. The main thing is to give communities of educational practice the time to share these experiences; and that includes both good practices and constructive failures (Edwards & Thomas, 2010). The education, the students and the staff members will definitely be better for it.

Appendix 1. **Bibliography**

In the article text references to sources were made written in black and in green. The black sources are references as we are used to reading them: they give evidence for what it says. The green sources are articles or other information that deal with the subject and are intended for those interested in the topic; as a start to further reading. Below, all sources (black and green) are organised alphabetically.

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Appendix 2. **Colleagues involved in (one of the) activities in the "100 DAYS OF... REFLECTION" 2021-2022**

Aalbers, Kristel
Abbink, David
Adrichem, Ted
Albertz-Paalvast, Mirjam
Andernach, Toine
Bliekendaal, Mariëtte
Bohm, Nina
Boom, Ton van den
Bossen, Linette
Cabo, Annoesjka
Cucurachi, Stefano
Cuschieri, Martina

Dijkstra, Wiebe
Dobbe, Roel
Dommelen, Sjoerd van
Ertsen, Maurits
Flipsen, Bas
Gammon, Andrea
Gonzalez Garcia, Yaiza
Gordijn, Johannetta
Guerreiro Goncalves, Milene
Haan, Eva de
Hayward, Ged
Heintz, John

Hermsen, Pleun
Hoebe, Eveline
Hugtenburg, Stefan
Jonquière, Franca
Kam, Angeniet
Kesler-van der Lugt, Judith
Renate Klaassen
Kooijman, Jolien
Loeve, Arjo
Luising, Alexia
Meulen, Stella van der
Mishra, Rohit

Mudde, Rob
Norbart, Adriaan
Overschie, Mariette
Persaud, Stefan
Piekaar, Merel
Rans, Calvin
Rijnbeek, Gytha
Rooij, Remon
Ruijgh-van der Ploeg, Tineke
Scholten, Victor
Schut, Suzanne
Sies, Puk

Smit, Roel
Smits, Casper
Sonneveld, Marieke
Sovago, Maria
Specht, Marcus
Stijntjes, Marjon
Verkuilen, Abboy
Zijlstra, Sake

Appendix 3. **Activities within "100 DAYS OF... REFLECTION" 2021-2022**

24 August 2021

Programme group meeting
Alignment with other TUD initiatives resolving around reflection

26 August 2021

Programme group meeting
Promotion, communication, website.

06 September 2021

Programme group meeting
Planning and structuring the upcoming '100 days'

14 September 2021

Programme group meeting
Planning and structuring the upcoming '100 days' (continued)

21 September 2021

Programme group meeting
Team meeting. Also, preparatory meeting for next session

21 September 2021

Journal Club #1
Turns, J. A., & Sattler, B., & Yasuhara, K., & Borgford-Parnell, J. L., & Atman, C. J. (2014, June), Integrating Reflection into Engineering Education. Paper presented at 2014 ASEE Annual Conference & Exposition, Indianapolis, Indiana. 10.18260/1-2--20668.

28 September 2021

Programme group meeting
Alignment with other TUD initiatives resolving around reflection

28 September 2021

Education Conversation
Exploring Reflection in Engineering Education
The Education Conversation originates from the wish of lecturers to discuss currently relevant educational topics with colleagues. The goal of this session was to collaboratively discuss the role of Reflection in engineering education. Central questions were: 'What defines a reflective engineer?', 'Why is it important to support engineering students in reflection?', and 'What type of reflection do you see happening?'

08 October 2021

Programme Director sessions
Reflection in Engineering Education
Every six weeks, the Teaching Academy organizes a meeting for programme directors of the bachelor's and master's programmes to share ideas and experiences on one central topic. This edition was on 'The Reflective Engineer' led by Pleun Hermsen. The goal of the session was to inventory what programmes are already doing in terms of (integrating) reflection in engineering education and to share these practices across programme and/or faculty boundaries.

11 October 2021

Programme group meeting
Team meeting. Also, preparatory meeting for next session

100 DAYS OF REFLECTION

26 October 2021

Journal Club #2
de la Croix, A., & Veen, M. (2018). The reflective zombie: problematizing the conceptual framework of reflection in medical education. Perspectives on Medical Education, 7(6), 394-400.

22 November 2022

Programme group meeting
Team meeting. Also, preparatory meeting for next session

23 November 2021

Journal Club #3
Verpoorten, D., Westera, W., & Specht, M. (2011). Reflection amplifiers in online courses: a classification framework. Journal of Interactive Learning Research, 22(2), 167-190.

29 November 2021

Programme group meeting
Team meeting. Also, preparatory meeting for next session

11 January 2022

Journal Club #4
van Merrienboer, J. J., & de Bruin, A. B. (2019). Cue-based facilitation of self-regulated learning: A discussion of multidisciplinary innovations and technologies. Computers in Human Behavior, 100, 384-391.

10 February 2022

Programme group meeting
Team meeting. Also, preparatory meeting for next session

22 February 2022

Journal Club #5
Ossa Parra, M., Gutiérrez, R., & Aldana, M. F. (2015). Engaging in critically reflective teaching: from theory to practice in pursuit of transformative learning. Reflective Practice, 16(1), 16-30.

24 February 2022

Programme group meeting
Team meeting. Also, preparatory meeting for next session

22 March 2022

Best practices sharing session Pitching Workshop
In this last open activity of our exploration, we invited lecturers to share their own experiences (cases) of integrating reflection in their educational practice. In preparation, we asked them to pay special attention to a) their motivation of getting involved with reflection, b) their approach of integrating reflection in their education, c) the challenges and results this approach brought you. The goal of this session was to connect lecturers involved in reflection with each other, but also to explore the common denominators for successful integration of reflection in engineering education.

01 April 2022

Programme group meeting
Whitepaper session (planning and framework)

14 April 2022

Programme group meeting
Writing session

13 May 2022

Programme group meeting
Writing session(continued)

23 May 2022

Programme group meeting
Revision of first version and sending out for feedback

10 June 2022

Programme group meeting
Feedback integration session

24 June 2022

Programme group meeting
Finalizing the whitepaper

100 DAYS OF *Reflection*