

WHO AM I LEARNING TO BECOME? INTEGRATING PERSONAL DEVELOPMENT IN CURRICULUM DESIGN

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ABSTRACT

In this case study, we answer the question: what are design characteristics for a personal development line integrated in undergraduate engineering curricula? We investigated the development of such a line in a Bachelor of Architecture, Urbanism and Building Sciences in The Netherlands. We documented and analysed the preparation of and discussions during three design sessions, where teachers and students collaboratively created the personal development line.

This personal development line has two main aims: to guide students in developing their personal and professional identities and promote self-directed learning in the curriculum. Reflective skills are playing a key role in this. Four levels on which students reflect in relation to personal development in the curriculum were identified: self, education, practice, and society. Each Personal Development Week in the design proposal touches upon one of these levels and makes use of three generic elements: inspiration, contemplation, and perspective.

Three tensions in the curriculum arose during the design sessions. First, the question if it is necessary to give students direction by assignments or to trust they will reflect by themselves. Second, if that direction should be shaped by specific writing assignments or if students should be left to work with a free form. Finally, if the reflection should be connected to what students learn inside the university or rather to societal challenges that they perceive outside of their studies.

The personal development line in this research is one answer to the questions arising from these three tensions, yet it is not the only answer. Both the identified tensions and the designed reflection model can be a starting point for other curriculum designers to position personal development in their curriculum. Personal development can then become a key ingredient in the education of a diverse group of reflexive engineers at universities anywhere in the world.

KEYWORDS

Curriculum development, personal development, self-directed learning, reflection, reflexivity, standards: 2, 3, 7, 9, 11

INTRODUCTION

There is not one kind of engineer. Undergraduate engineering curricula need to be flexible enough to educate different personal and professional identities. Increasingly, universities try to offer inclusive education with awareness of their students' backgrounds (McKenna et al., 2014). Furthermore, the world expects engineers to be self-critical and equipped with the critical thinking skills necessary for the transition to a sustainable society (Wals, 2010). Therefore, students need to learn to reflect on their personal development during their education.

The CDIO approach (Conceiving – Designing – Implementing – Operating), an innovative engineering education framework, integrates reflection in their key features (Cheah, 2022). The approach is based on the idea that students learn the fundamentals of engineering through experience with real-world systems, products, processes, and services (Malmqvist et al., 2019). Students need to be equipped with reflective skills to learn from those real-world experiences. Different reflection methods exist for addressing personal development in individual courses, yet we know little about the use and effect of reflection in curriculum as a whole (Ebomoyi, 2020).

In this case study, we research the question: what are design characteristics for a personal development line integrated in undergraduate engineering curricula? We investigated the development of such a reflective line in the Bachelor of Architecture, Urbanism and Building Sciences at Delft University of Technology in The Netherlands. Based on an analysis of the Intended Learning Outcomes related to reflection, a design brief was defined for this programme by the Education Management. Additionally, we documented and analysed three curriculum design sessions, where teachers, educational advisors and students collaboratively created the personal development line.

THEORETICAL BACKGROUND

Reflection is a specific form of thinking (Dewey, 1910). Not only is reflection crucial to learning in general, but it can also be learned. It is this specific form of 'academic reflection' that we focus on in this paper and that can also be called 'metacognition' (Cunningham et al., 2015). Within the CDIO network, Cheah (2022) proposes to clarify the language for reflection and refers to this definition of Moon (2001) as a guideline: "Reflection is a form of mental processing – like a form of thinking – that we use to fulfil a purpose or to achieve some anticipated outcome. It is applied to relatively complicated or unstructured ideas for which there is not an obvious solution and is largely based on the further processing of knowledge and understanding and possibly emotions that we already possess."

Although reflection is a cognitive skill used in everyday life, it has a specific function in education. Academic reflection involves a consciously stated purpose that gives direction to the reflection (Moon, 1999). Through reflection, learning on personal and professional level can be made explicit, where it would otherwise remain implicit. This way, reflections can provide evidence of learning that could be used for assessment as well as for self-directed learning. Students undertaking self-directed learning take control of their own learning by making use of the flexibility in the curriculum to, for instance, choose electives, paper topics, or challenges that fit their ambitions (Brockett & Hiemstra, 1991).

In higher education, the evidence of reflection is predominantly collected as reflective writing. Particularly in experiential courses, reflective essays, papers, and reports are increasingly used as assessment methods (Kirk, 2017). These reflective assignments which require a personal voice should be clearly distinguished from essay writing on a scientific topic that aims

to develop a logical argument (Nesi et al., 2021). To scaffold students towards reflective writing, Ryan and Ryan (2013) developed the 4Rs model (Reporting, Relating, Reasoning, and Reconstructing) for teaching and assessing reflection in higher education, which is often used as backbone for reflection assignments in higher education.

Most scholars describe reflection as a process with different deepening layers (Bain et al., 2010). The 4Rs model, for example, asks students to connect their individual experiences to literature and incorporate the perspectives of others in their writing. Students not only 'describe' what they experienced, they also 'compare' and reframe the matter through the eyes of others (Jay & Johnson, 2002). Ultimately, this can lead to a critical reflection, where students create an alternative perspective based on renewed insights.

In (architectural) design education, students learn reflection mostly in the design studio. Design expertise is being built through constant reflection on the object that is being designed (Lawson & Dorst, 2009). The work of Van Dooren et al. (2013) describes the generic elements that architecture students discussed while learning to design. Although reflection is integrated in the way students learn to design, we do not know to what extent students can transfer the skill of reflection on their design object to reflection on their personal development.

In this compact overview of the literature, two important things stand out. First, although many different reflection tools exist in practice, reflection assignments in higher education focus on writing, and in design education on the designed objects. Second, those reflection assignments are connected to the learning process during one course but rarely extend to include the development of students within an entire curriculum. Therefore, we explore how reflection can be incorporated through the curriculum as a whole and which learning objectives can be achieved aimed at the personal development of students.

METHODS

We investigate the development of a personal development line in the Bachelor of Architecture, Urbanism and Building Sciences at Delft University of Technology in The Netherlands. Based on an analysis of the Intended Learning Outcomes related to reflection, a design brief was defined for this programme by the Education Management. We document and analyse three curriculum design sessions, where teachers, educational advisors and students of the faculty collaboratively create proposals for the personal development line. Our approach is based on educational design research. Plomp and Nieveen (2014) define design research in an educational context as follows: "To design and develop an intervention (such as programs, teaching-learning strategies and materials, products, and systems) as a solution to a complex educational problem as well as to advance our knowledge about the characteristics of these interventions and the processes to design and develop them, or alternatively to design and develop educational interventions (about, for example, learning processes, learning environments, and the like) with the purpose to develop or validate theories." (Plomp & Nieveen, 2014, p. 15)

This design research looks at the personal development line as a solution to the complex educational question of how to guide students in developing their personal and professional identities. In this process, we aim to find characteristics from the personal development line to advance our knowledge of self-directed learning. Additionally, we document the tensions and challenges that teachers and students discuss while designing the personal development line.

RESULTS

Intended Learning Outcomes related to reflection

Starting point of the educational design process was the analysis of the Intended Learning Outcomes of the Bachelor Programme, looking from the perspective of reflection and of personal development. The Intended Learning Outcomes are divided in seven groups, of which two groups are the most important for this topic: temporal and cultural context, and academic attitude. Within these two categories seven Intended Learning Outcomes were found that relate to reflection and personal development:

Temporal and cultural context

- The student has an ethical-professional understanding and can reflect on the role and position of the field of architecture in society.
- The student can critically reflect on him/herself as a construction engineering student and on the processes and products of study.
- The student can assess the position of the designer, the engineer, the planner and the manager of the built environment within the field of private and public parties and the civic society.

Academic attitude

- The student is independent and has the ability to ask and discuss relevant questions.
- The student has a critical-reflective attitude toward science, engineering, research and design.
- The student can take a considered position in design situations.
- The student can argue persuasively and in a well-structured manner.

Design brief for the Personal Development Weeks (PDW)

These Intended Learning Outcomes were already being addressed in various design, research and skills courses, but in a rather implicit way. Therefore, the Education Management proposed the first outline of a personal development line, consisting of five Personal Development Weeks (PDW), spread across the curriculum: halfway each semester of the three-year Bachelor Programme (the P's in **Figure 1**).



Figure 1. Proposed re-design of the Bachelor Programme in Architecture, Urbanism and Building Sciences, with 6 learning trajectories: ON Design (6*10 ECTS), WV (Science and skills) (6*5 ECTS), TE Technology (5*5 ECTS), GR Fundamentals (4*5 ECTS) and MA Society (3*5 ECTS); T = assessment weeks; P = Personal Development Weeks.

The PDWs were given the following starting points for the design sessions:

- PDW assignments might have a free form.
- A PDW will have no teaching hours, but only one small reflection assignment to be made.
- A PDW will not lead to separate ECTS's, but the five assignments will be part of the last course of the Science and skills trajectory (WV6) in the Bachelor Graduation Project (BGP).
- PDW assignments will be assessed in this WV6 course, but they will also start the group discussion in the course that immediately follows every PDW.
- For the PDW assignments it is being proposed to deepen and enrich reflection through the programme, based on four levels on which students can develop their personal and professional identities: self, education, practice, and society (see **Figure 2**).

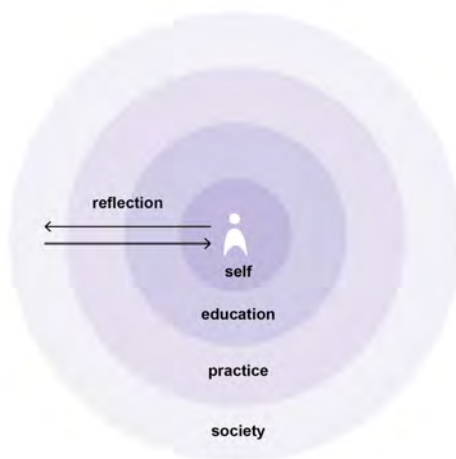


Figure 2. Four levels (self, education, practice, and society) on which students can develop their professional and personal identities. Reflection as part of the curriculum allows students to switch between these levels.

Design sessions for the Personal Development Weeks

The Intended Learning Outcomes and the design brief formed the starting point for three design sessions with teachers, educational advisors, and students. We organized one exploratory workshop (design session 0) with reflection experts from several other higher education institutes to refine the design brief before the PDW design team started (see **Table 1** for an overview of the sessions and themes). In the next paragraph, we will describe the design proposal that resulted from these sessions.

Table 1. Themes of the design sessions between November 2022 and April 2023.

Design session	Dates	Theme
Design session 0	November 16	EXPLORE - What do the concepts of reflection and personal development entail?
Design session 1	February 7	START - What do we already know about reflection and personal development in our current curriculum?
Design session 2	March 9	AIMS - What are we aiming for?
Design session 3	April 6	ACTIVITIES - What are the reflective activities we envision to use in the personal development line?

The design proposal of the Personal Development Weeks

A personal development line spread over three years

There are five PDWs in the three-year Bachelor Programme: two in each of the first two years and one in the final year. The design team agreed that every year should have a specific focus. Year one could focus on the transition from high school to university student and the hopes and dreams that belong to the start of university education (self). At the same time, the first-year PDWs should address the practical and content-related side of being a university student, such as time management, cooperating in teams, dealing with feedback, and getting familiar with learning styles and with the fundamentals of the discipline (education). A central role for student tutors was proposed in the first year, for instance in the form of peer guidance and review. In this first year, the PDWs should contribute to community building within the student cohort, as this will keep students motivated throughout the curriculum.

In year two, the PDW will stimulate students to reflect on their development as designers within the discipline (practice). As the PDWs in the second year are scheduled after the design studios (ON courses in **Figure 1**), they offer an ideal opportunity to reflect on the experiences from the studio and prompt questions such as 'what kind of designer am I?'. The PDWs will also focus on career orientation. As such, the PDW should be aligned with the information meetings for the Master Programmes.

The third year focuses on making connections to societal challenges (society). Assignments will evolve on defining a position in the entire spectrum from self to society. The question can be raised how reflection can lead to action: who am I and what role can I play in society?

Three generic elements in each Personal Development Week

The design team aimed at activities to be largely self-defined by students and to be taking place outside of the familiarity of the campus. For instance, students could be asked to go outside, to walk, to visit museums, or go on excursions. In addition, relevant workshops or lectures can be organized on-campus. The team had different opinions on how concrete the assignment should be: from prescribed to completely free assignments. Ideas for forms could be journals, videos, posters, infographics, sketches, or even songs and spoken word.

Nevertheless, three generic elements were proposed for each of the five PDWs: inspiration, contemplation, and perspective. Although they do not correspond to specific learning objectives that are being assessed within the PDWs, these three generic elements do describe the aims that the design team had for the personal development line as a whole.

First, inspiration arose from a wish of both students and teachers to have time to explore interests that are not part of the core curriculum but do relate to the discipline. Furthermore, it is important to know what you will be reflecting on in the PDWs, and in that sense, inspiration can also come from looking back at experiences from other courses.

Second, contemplation refers to both the active reflection on inspiration and other experiences, as well as the wish to 'rest'. In this case, rest does not mean holiday, but it does mean to be in a different mental space than during the regular curriculum.

Third, students will look ahead at what is next. The step of creating perspective, for instance by formulating personal learning goals, is crucial to self-directed learning. This is the moment in the week where students will be able to take all the insights they have gained and transform them into calls for action.

A common starting and finishing point for the curriculum

The introduction of the PDWs requires a different approach to education. The activities need to speak to the intrinsic motivation of the students to explore their personal development. From the assessment point of view, the design brief stated that the products of the five assignments will be part of the last course of the Science and skills trajectory (WV6 in **Figure 1**). To emphasize the importance of the PDWs right from the start, they will need a thorough introduction in the first Science and skills course (WV1 in **Figure 1**). Furthermore, the design team proposed the first day of the first year of the bachelor as part of the personal development line (**Figure 3**). During this day, students will get familiar with reflection tools for personal development and touch upon some of the key themes of being a first-year student at university.

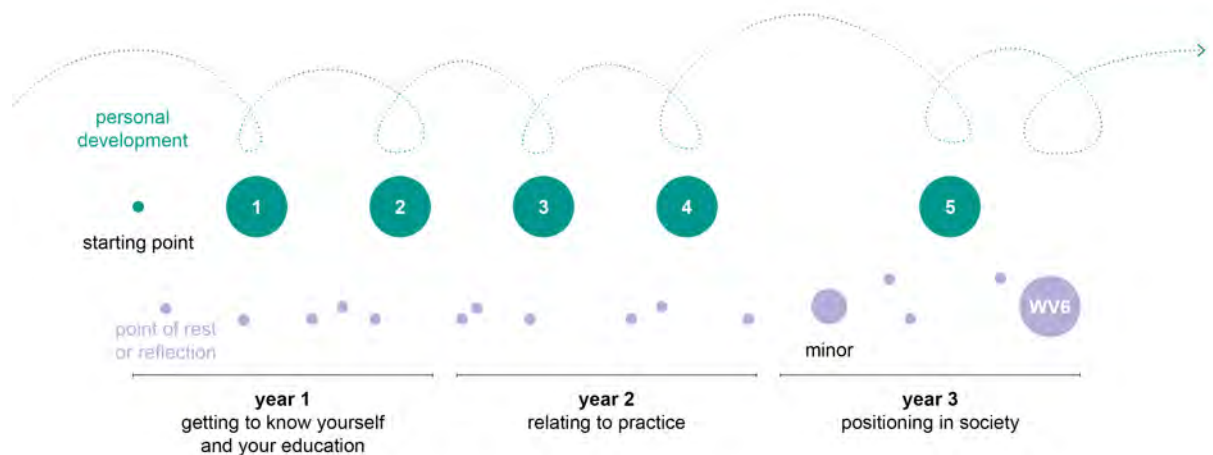


Figure 3. A visualisation of the Personal Development Weeks created by the design team. It shows both the personal development line (green), as well as a suggestion for the points of rest and reflection in other courses (purple).

DISCUSSION

The curriculum design sessions revealed several tensions. Three of those tensions resurfaced more frequently in the design team's discussions and we consider them to be significant for others who work on methods for reflection and personal development in undergraduate engineering curricula.

The first tension is that between designing a full reflection assignment and the option to not design anything and leave the weeks for personal development completely empty in the schedules of students and teachers. Could the necessary reflection be achieved equally well outside the curriculum and the faculty building as within?

The answer formulated by the design team is 'no'. Free time outside of the curriculum is not automatically being spent on personal development. Getting grip on that personal development is deemed crucial for self-directed learning in the rest of the curriculum.

Second, the design team was confronted with ideas of what education traditionally should look like. Self-directed learning puts some responsibilities on the student that used to be with the teachers. Should the reflection assignments be specified tasks with a well-defined outcome, or will the reflection benefit from an assignment with a free form?

Some general considerations were made during the design sessions. The general opinion was to make the assignments (very) small. At the same time, students should not have the idea that there is only one 'nasty' task to do in a week that is meant to recuperate; this is considered a complicated tension. Therefore, the assignments should be formulated in a positive way, with – especially in the first year – a clear relationship with the following course. This makes it necessary that the teachers of those courses are well-informed of the PDW assignment and its use and role in the curriculum.

Finally, we noticed a tension between relating the PDWs to the specific preceding courses, or to the personal development of the students in general. Will the reflection assignments increase in value for the students if we give them the opportunity to address present societal challenges, such as sustainability or health?

The design proposal suggests leaving the assignments open both in form and content, so students can follow their own inspiration. However, in the second and third year, the aim to relate to design practice and society should be made explicit.

There is not one answer to these tensions that applies to every undergraduate engineering curriculum. However, those interested in using reflection as an explicit part of the curriculum can use these tensions as starting points for their discussion.

CONCLUSION

Students get to know their engineering identity and future role in society by reflecting on their personal development throughout the curriculum. In this paper, we researched the design of a personal development line on curriculum level that aims to guide students in developing their personal and professional identities and promote self-directed learning.

This educational design research focused on the analysis and design brief for a personal development line in an undergraduate engineering curriculum in the Netherlands and on the design team of students, educational advisors and teachers elaborating this programme. The starting point was a personal development line of five Personal Development Weeks, based on four levels of reflection: self, education, practice, and society.

In the design proposal, each Personal Development Week touches upon one of these levels. Additionally, every week makes use of three generic elements to offer students guidance in the process of reflecting: inspiration, contemplation, and perspective. The personal development line has a common starting point on the first day of the academic year for all first-year students to get familiar with reflection tools for personal development and touch upon some of the key themes of being an academic. As the line encompasses more reflective levels over time, it asks students to reconsider their position based on new insights they gain. The first weeks focus on the students themselves and the way they learn, and then the PDWs gradually shift to comprise their professional career orientation and role in society.

Throughout the design process, three characterizing tensions arose. First, the question if it is necessary to give students direction by assignments or to trust they will reflect by themselves. Second, if that direction should be shaped by specific assignments or if students should be left to work with a free form. Finally, if the reflection should be connected to what students learn inside the university or rather to societal challenges that they perceive outside of their studies. The personal development line in this research is one answer to the questions arising from these three tensions, yet it is not the only answer. We hope that by making these tensions insightful for other curriculum designers, they might find their own way of navigating them towards a more reflective and flexible curriculum.

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REFERENCES

- Bain, J. D., Mills, C., Ballantyne, R., & Packer, J. (2010). Developing Reflection on Practice Through Journal Writing: Impacts of variations in the focus and level of feedback. *Teachers and Teaching*, 8(2), 171-196. <https://doi.org/10.1080/13540600220127368>
- Brockett, R. G., & Hiemstra, R. (1991). *Self-direction in Adult Learning: Perspectives on Theory, Research and Practice*. Routledge. <https://doi.org/https://doi.org/10.4324/9780429457319>
- Cheah, S.-M. (2022). *Continual Improvement in CDIO: Enhancing faculty competency in reflective practice* Proceedings of the 18th International CDIO Conference, Reykjavik University, Reykjavik Iceland.
- Cunningham, P., Matusovich, H. M., Hunter, D. A. N., & McCord, R. E. (2015). *Teaching Metacognition: Helping Engineering Students Take Ownership of Their Own Learning* Frontiers in Education Conference, El Paso, TX, USA.
- Dewey, J. (1910). *How We Think*. D.C. Heath & Co Publishers.
- Ebomoyi, J. I. (2020). Metacognition and Peer Learning Strategies as Predictors in Problem-Solving Performance in Microbiology. *J Microbiol Biol Educ*, 21(1). <https://doi.org/10.1128/jmbe.v21i1.1715>
- Jay, J. K., & Johnson, K. L. (2002). Capturing complexity: a typology of reflective practice for teacher education. *Teaching and Teacher Education*, 18(2002), 73-85.
- Kirk, S. (2017). Waves of Reflection: seeing knowledges in academic writing. EAP in a rapidly changing landscape: issues, challenges and solutions,
- Lawson, B., & Dorst, K. (2009). *Design expertise*. Architectural Press.
- Malmqvist, J., Wedel, M. K., Lundqvist, U., Edström, K., Rosen, A., Astrup, T. F., Vigild, M., Hussmann, P. M., Grom, A., Lyng, R., Gunnarsson, S., Huay, H. L.-W. K., & Kamp, A. (2019). *Towards CDIO Standards 3.0* Proceedings of the 15th International CDIO Conference, Aarhus University, Aarhus Denmark.
- McKenna, A. F., Froyd, J., & Litzinger, T. (2014). The Complexities of Transforming Engineering Higher Education: Preparing for Next Steps. *Journal of Engineering Education*, 103(2), 188-192. <https://doi.org/10.1002/jee.20039>
- Moon, J. A. (1999). *Learning Journals: A Handbook for Reflective Practice and Professional Development*. Routledge. <https://doi.org/https://doi.org/10.4324/9780429448836>
- Moon, J. A. (2001). *Reflection in Higher Education Learning* PDP Working Paper 4, University of Exeter.
- Nesi, H., Gardner, S., Chapelle, C. A., & Hunston, S. (2021). *Genres across the Disciplines*. <https://doi.org/10.1017/9781009030199>
- Plomp, T., & Nieveen, N. (2014). *Educational Design Research*. SLO. <https://doi.org/10.1007/978-1-4614-3185-5>
- Ryan, M., & Ryan, M. (2013). Theorising a model for teaching and assessing reflective learning in higher education. *Higher Education Research & Development*, 32(2), 244-257. <https://doi.org/10.1080/07294360.2012.661704>
- Van Dooren, E., Boshuizen, E., Van Merriënboer, J., Asselbergs, T., & Van Dorst, M. (2013). Making explicit in design education: generic elements in the design process. *International Journal of Technology and Design Education*, 24(1), 53-71. <https://doi.org/10.1007/s10798-013-9246-8>

Wals, A. E. J. (2010). Between knowing what is right and knowing that is it wrong to tell others what is right: on relativism, uncertainty and democracy in environmental and sustainability education. *Environmental Education Research*, 16(1), 143-151. <https://doi.org/10.1080/13504620903504099>

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