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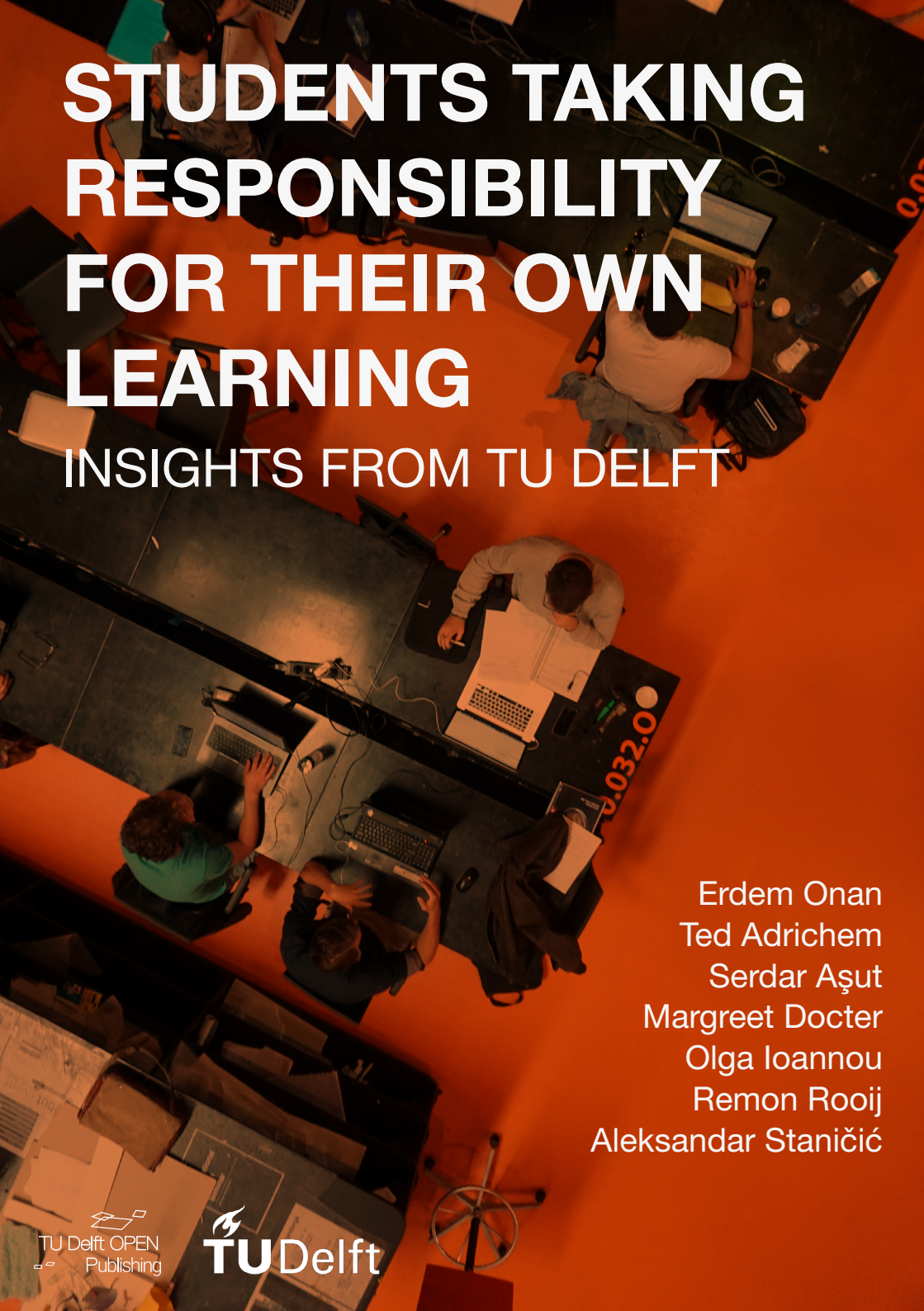
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STUDENTS TAKING RESPONSIBILITY FOR THEIR OWN LEARNING

INSIGHTS FROM TU DELFT



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Students Taking Responsibility for Their Own Learning: Insights from TU Delft

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Image 1. BK van boven Oostserre [BK from above Oostserre], by TU Delft Mediaportal, 2017, Public Domain.

Preface

Helping students to develop a sense of responsibility for their learning is widely recognized as a key goal of higher education. 'Taking responsibility', in a broader sense, has been identified by the Organization for Economic Co-operation and Development (OECD) as one of the three critical transformative competencies, along with creating new value and reconciling tensions and dilemmas, that every student should develop to navigate the unpredictable societal, economical, and environmental challenges of the future (OECD, 2019). Yet, taking responsibility – particularly in the context of learning – is a complex construct as it carries multiple meanings, interpretations, and implications. Many questions arise from this complexity, such as: What does taking responsibility for learning mean for the members of our community? How can students at TU Delft demonstrate responsibility towards learning in their attitudes and actions? And what conditions support or hinder the development of such an approach to learning?

The need to explore these questions more deeply led to a collaboration between the 100 Days of… initiative and the IDEE (Innovation in Delft Engineering Education) Students Taking Responsibility project. Through engagement with academic staff, support staff, and students, as well as a series of workshops and research activities, the two initiatives examined what it means for students to take responsibility for their learning within the TU Delft educational landscape. This exploration was driven not only by the aim of improving our own educational context, but also by the intention to offer insights that may be relevant to other institutions. The goal was not to pin the concept of responsibility down to a single definition, but rather to identify and establish common ground regarding students taking responsibility, which could in turn guide future developments in this area. More specifically, we sought to clarify key concepts, identify existing theories, and map different approaches through journal clubs, lectures, educational dialogues, case-pitching activities, literature reviews, and teacher interviews. This book shares the lessons learned through these events, aiming to unpack this broad and

nuanced construct and to make the idea of responsibility for learning more tangible and actionable within the context of TU Delft's engineering education and beyond.

The book is structured to support different kinds of readers and needs and organized into five sections. Section 1 argues why it is crucial for students to develop a sense of responsibility for their learning, taking into account societal, economic, and environmental challenges, as well as TU Delft's broader institutional ambitions. Section 2 offers our first attempt to introduce a set of dimensions that make the construct more concrete, by showing how students can assume responsibility for their learning and demonstrate it through specific attitudes and actions. Section 3 identifies potential facilitators and obstacles, at both the student and course levels, that may facilitate or hinder students in this process. Section 4 provides examples from our community that illustrate how students can be supported in practice. Finally, Section 5 presents a call to action: it identifies areas where TU Delft can collectively move forward, by proposing directions for further research and innovation, through which students, teachers, and the institution can jointly shape a culture, wherein students' willingness and ability to take responsibility for their learning is recognized, valued, and supported. Together, these sections offer multiple entry points: readers may follow the full journey or focus on the parts most relevant to their role.

1. Introduction and background

"In our team, we carry the responsibility of making final decisions together."

"I want my peers to take more responsibility for their actions; we should be ready to face the consequences of our choices."

"This is what I aspire to: I want to become a responsible engineer."

All these fictional sentences use the term *responsibility* in educational contexts, yet each delivers a different meaning. The first instance refers to a shared duty or obligation, while the second is closely associated with accountability – being answerable for one's actions. The third instance demonstrates how responsibility can emerge as an attribute (e.g., trustworthiness), as part of one's desired professional identity. This diversity highlights the challenge of defining responsibility, especially in the context of learning and education. It is not a single or fixed construct, but a multifaceted one shaped by context, relationships, and values.



Image 2. Source: Pixabay, 2022. Public Domain.

From educational science perspective, this difficulty to conceptualize and operationalize student responsibility for learning is further compounded by its entanglement with related constructs, such as:

- Learner agency: One's desire and capacity to make choices, which is shaped by structural and contextual factors (Jääskelä et al., 2017).
- Selfregulated learning: A goal-oriented process, in which students monitor and control their thoughts, behaviors, beliefs, and feelings (Zimmerman, 2002).
- Student autonomy: The ability to act in response to one's own desires and choices (Reeve & Jang, 2006).
- Responsibility for learning: A sense of duty or obligation dedicated to producing or preventing a learning outcome, sourced through internal motives (Lauermann & Karabenick, 2011).

The significant overlap among these constructs, along with the absence of clear structure, relations, and boundaries, makes it necessary to be specific about how taking responsibility for learning is understood and examined in any given context – a critical first step in designing instructional approaches to support students in achieving this goal.

Accordingly, one of our main objectives during the 100 Days of STR activities was to explore how students may take responsibility for their learning by using both top-down and bottom-up approaches. The top-down approach involved consulting the relevant literature from educational science and psychology, focusing on responsibility for learning and related constructs such as learner agency. The bottom-up approach sought to situate this construct inside the educational culture of TU Delft. This was based on the input and participation of a wide range of community members, such as students, teachers, researchers, learning developers, and program coordinators. With this book, our aim is not to provide a final definition of student responsibility for learning – or how students should take responsibility for their learning – but rather to make the construct more accessible, relatable, and actionable within our community.

Before turning to a discussion of how responsibility for learning can be defined and demonstrated by students, we first describe why this construct matters and how it is currently positioned within TU Delft.

1.1. Students taking responsibility for their learning: Why?

Current global criticalities are challenging educational systems. Matters like climate change, global health issues, social injustice, and rapid AI developments exert pressure on education. Universities are challenged to think afresh about the responsiveness and relevance of their curriculum and mode of pedagogy regarding those environmental, social, and political realities (Mostafavi, 2020). However, the non-linear behavior of these ecosystems (i.e., interconnected systems, in which global criticalities exist, e.g., civic society, financial structures) gives way to an ever-growing sense of complexity; not only because of the rapidity of changes, but also because the challenges they bring forward are open-textured and may never be solved in a simple manner (Barnett, 2004). Consider the COVID-19 pandemic, in which a single development in public health affected education, economies, and global politics, showing how changes in one area may cause unpredictable and sometimes disproportionate impact on others. Such interconnectedness further means that challenges are not only complex but may also be contested, as they invite multiple interpretations, which can be at times conflicting or incompatible. A good example is climate change, which has been framed as a call for radical degrowth, an opportunity for a green economy, or by some as an issue of lesser urgency. These perspectives coexist, yet they cannot always be reconciled, highlighting the difficulty of addressing such problems.

The university is not separate from such multiple ecosystems, but it is deeply affected by their mutual interdependence. This recognition raises two important questions: What is the university's responsibility, and what are the roles and responsibilities of our students and teachers? These questions are not easy to resolve, but there are notable attempts exist, such as Ronald Barnett's (2018) idea of the Ecological University.

This view stands in contrast to industrial, market-driven, and mono-disciplinary views of the university. Barnett argues that universities should engage not only with the complexity of societal challenges but also with the pedagogical challenges that arise from such an understanding of the world – one that is unpredictable, interconnected, and complex. Accordingly, a central role of the university is to prepare students for the future, but here the preposition 'for' carries weight. As Barnett (2004) emphasizes, uncertainty about the best ways to support students is also growing: What competencies will today's and tomorrow's learners need in order to exercise agency and responsibility in addressing the complex challenges ahead? And how should this shape our teaching practices?



Image 3. BK van boven Zuidserre [BK from above Zuidserre], by TU Delft Mediaportal, 2017, Public Domain.

Ecological literacy emerges as a reaction to these pivotal inquiries. It emphasizes the skills and attitudes necessary to comprehend and operate within complex interconnected systems. For example, system thinking, which is a critical component of ecological literacy, posits how important it is to develop a holistic view, where people can see ecosystems as whole entities rather than just the sum of their parts. This viewpoint links individual learning and responsibilities to changes at the level of communities and ecosystems (Bianchi et al., 2022), and it challenges traditional, siloed, and mono-disciplinary approaches to knowledge creation. Instead, it advocates for "the dialectic premises that underlie sociocultural, situative, and socio-material approaches," in which learning is not a confined internal process, but involves "mutually constitutive relationships between individuals and environments", ultimately transforming both the person and the environment (Damşa et al., 2019, p. 2077).

Amid the broader discussion on the goals of education and the responsibilities of universities, learning theories have proliferated since the 1980s that emphasize interactive, collaborative, and mutually transformative learning environments, where the roles of individuals are significantly enhanced. For instance, theories such as Communities of Practice (Farnsworth et al., 2016) offer a more nuanced interpretation of constructivism and social learning by assigning learners accountability not only for their own learning but also for the community of which they are a part. Building on this tradition, more contemporary theories that address emerging technologies, such as Connectivism (Siemens, 2005), Communities of Inquiry (Garrison et al., 2010), Heutagogy (Kenyon & Hase, 2000), and Self- and Socially Shared-Regulated Learning (Zimmerman & Risemberg, 1997), have further advanced this notion by using the network metaphor and by shifting emphasis away from content delivery toward learners' connectivity and interaction (Anderson, 2016).

An important element shared by the aforementioned theories is the idea that learning occurs within "nebulous environments of shifting core elements that are not under the control of the individual" (Siemens, 2005). In such contexts, learning is described as rhizomatic. That is to say, it grows in multiple interconnected directions without a fixed hierarchy. As

a result, learning is understood as having “mutable goals and constantly negotiated premises”, where the community is not merely a pathway to the curriculum but, in fact, “the community is the curriculum” (Cormier, 2008). In these environments, learning takes the form of actionable knowledge, which is not only acquired in a confined, sterile context, but also applied in practice to solve problems, make decisions, and adapt to changing circumstances.

Traditional content-delivery models of education often share these aims, but they pursue them through teacher-led instruction and a predefined curriculum. By contrast, networked approaches place greater responsibility on students, who must actively determine what is important, disregard what is not, and recognize when new information requires them to update their understanding. For example, in a large online course on climate change, learners may need to navigate research articles, policy reports, and peer contributions to assess their credibility, identify what is relevant, and apply insights to their own contexts. In this way, responsibility for learning is distributed differently: rather than resting primarily with the teacher and curriculum, it increasingly lies with learners, who must navigate and construct meaning within evolving knowledge landscapes (Siemens, 2005). However, the integration of the notion of learners’ responsibility towards their learning has been characteristically slow in pedagogy: the distributed, destabilizing nature of ‘nebulous’ learning environments as well as their informality clashes with the formal, hierarchical order of academic institutions and the established educational formats across disciplines (Ioannou et al., 2020).

So, what do these theoretical perspectives mean for education at TU Delft? We believe they invite us to take a closer look at our students, our teachers, and our learning environments. Students will need to cultivate attitudes, skills, and competencies that allow them to take and feel responsibility for their learning. University educators, in turn, need sufficient space and support to guide students in this process. Learning environments should provide the flexibility and agility that enable students to take a more active role in shaping their own learning. At the

same time, it is important to recognize that certain aspects of our current practices, whether in teaching or curriculum design, may unintentionally discourage responsibility.

We think that responsibility appears as a common thread across the frameworks discussed above and suggest that it should be considered a key competence for knowledge creation itself. Yet, there are indications that some degree programs at TU Delft may not always provide the flexibility needed to foster student responsibility for learning. Where learning objectives are narrowly defined, often with an emphasis on technical skills, opportunities for developing personal and interpersonal competencies may be more limited. In addition, failure is not consistently acknowledged as a legitimate part of learning. Some students seem to fear failure and the responsibility that comes with it, an issue that may be reinforced by grading systems that encourage strategic studying for passing and grades rather than intrinsic engagement with learning. As Alfie Kohn (2018) has argued, this can result in "punishment by reward".

Against this background, taking responsibility for learning may not be an easy feat for all students: not all students are equally ready or willing to take responsibility in this way. Learning through making choices can create a sense of moral overload, when competing obligations cannot be fulfilled simultaneously (Van den Hoven et al., 2012). In fact, teachers also face challenges: many feel compelled to steer, struggle to "let go" and trust their students, or lack the time and knowledge to fully support this shift.

Taken together, in our view, opening up curricula and pedagogy to accommodate responsibility is an important next step. Through our Students Taking Responsibility innovation and research program, we aim to improve our understanding of this theme and to develop evidence-informed strategies, interventions, and tools for students, teachers, and the wider organization. We see this work as part of a cultural transition: moving toward a teaching and learning culture in which TU Delft students can take greater responsibility and agency for their learning, learning trajectories, exit profiles, and professional identities. Likewise, TU Delft teachers can further strengthen their capacity to design,

organize, and teach in ways that encourage responsibility and agency. Finally, our students should be supported by learning environments, coaching teachers, and appropriate tools and technologies that make such responsibility both possible and sustainable.

1.2 TU Delft institutional ambitions

TU Delft's institutional educational ambitions are described in its institutional Strategic Agenda 2024-2030 *Impact for a Sustainable Society* (Delft University of Technology, 2024a) and in institutional Vision on Education 2024-2030 *Educating Future-Proof Engineers* (Delft University of Technology, 2024b). Additionally, the study *Changing Futures of Engineering Education – TU Delft looking towards 2050* (Boxall, 2025) complements those two formal policy documents by a long-term oriented exploration on engineering education values and pedagogies.

A closer look at these reports shows that the concept of responsibility appears in several places and is framed in two main ways. First and foremost, it is used to emphasize TU Delft's ambition to educate engineers who act responsibly and practice responsible engineering. According to this vision, being an engineer entails more than showing technical proficiency, but also requires aligning with global challenges set out in the UN Sustainable Development Goals, treating responsibility as both a matter of professional expertise and a consideration of the wider implications of one's own actions (Delft University of Technology, 2024b). That is, responsible engineering includes ethical awareness, societal concern, and environmental sensitivity, coupled with a willingness and ability to consider and embrace the consequences of one's actions. With this vision, TU Delft aims that students develop humility, respect, and recognize the limitations of their knowledge and methods. Furthermore, it shows the ambition to foster socially aware and ethically minded engineering, which is reflective and technically proficient – helping students to become professionals who are capable of understanding the challenges they encounter and intervene responsibility to overcome them (Delft University of Technology, 2024b).

Additionally, Boxall (2025, p. 13), based on several interviews with engineering and engineering education experts, situates responsibility in a societal perspective. He argues that by 2050, "the impacts of engineering technologies and the roles of engineers, … will be ubiquitous across the workings of society and the experiences of human lives, in ways that offer great benefits but may not always be unequivocally and universally welcomed". An important implication of such a future is that engineers will not only be required to design and implement technical solutions, but they will also need to adjust to and navigate the social and ethical tensions that accompany them. As a result, the responsibilities carried by tomorrow's engineers will extend beyond technical competence, including their role in shaping how technologies interact with and are received by society.

A second way in which responsibility is framed in these documents is the focus on personal development, specifically through individual predispositions and competencies, including growth mindset (i.e., the belief that talent and intelligence can be improved through practice and effort), reflexivity (i.e., critical self-examination), proactivity (i.e., planning and preparing for the future rather than reacting to events), and personal resilience (i.e., coping with and recovering from adversity). For such qualities to genuinely take root, however, the design of education itself must enable students to practice and cultivate them. Therefore, the TU Delft Vision on Education brings these developmental aims together under the notions of ownership of learning and meaningful, adaptive educational experiences. It stresses that "good education is reciprocal and responsive. It is a relationship, not a transaction. It cannot be fully pre-planned or programmed. There must be room for true interaction where educators and students shape courses in response to, and in co-creation with each other. Our didactic approach is inspired by the idea that education should focus on qualifications as well as socialization (becoming part of societal norms and cultures), and personal development" (Delft University of Technology, 2024b). To achieve this, Boxall envisages four educational approaches (Boxall, 2025, p. 5):

- Blurring of internal and external institutional boundaries through cross-disciplinary and bespoke programs co-designed and co-delivered with ‘front-line’ business and public service partners.
- Moving the pedagogic focus from prescriptive knowledge acquisition towards formative experiences designed to equip tomorrow’s practitioners for different domains of the future engineering landscape.
- Grounding these experiences in the realities of the places and communities in which institutions and their students live and work, instilling understanding of the users and others impacted by engineering solutions.
- Offering students different learning pathways and program content tailored to their chosen career paths, usually built on common foundational programs.

Nonetheless, feeling responsible, being given responsibility, and taking responsibility can be stressful for students. Such responsibility therefore needs to be gradually introduced, trained, and scaffolded. For readers interested in practical implications, we refer to Section 4, where we present various instructional practices developed and applied within TU Delft.

2. Students taking responsibility for their own learning: Its characteristics and dimensions

What role should students play in their learning? This question has been widely debated for decades and is tied with fundamental concerns about how learning occurs and how instruction should be designed to support it. Earlier approaches, particularly those rooted in behaviorist theories, tended to describe learning as a relatively permanent change in one's behavior through conditioned interaction with the environment. Learners respond to external stimuli, and the consequences of this interaction determine whether they adopt, sustain, or abandon an action (Watson, 1913). This definition assumes that the goal of instruction is to strengthen the association between response and stimuli, assigning learners a somewhat passive role – compared to teachers – in their education, as their actions, knowledge structure, and belief systems are shaped primarily through environmental factors rather than by their active engagement (Mayer, 1992).

Over time, learning theories have experienced a definitive shift, moving away from behaviorist approaches that focus on stimulus-response patterns toward more nuanced cognitivist and constructivist approaches. For instance, cognitive constructivism, rooted in Piaget's work, suggests that learning is not a matter of remembering facts, but rather a dynamic process, in which individuals adjust their internal mental 'schemata' to accommodate new information (Kalina & Powell, 2009). Under this lens, knowledge is constructed as learners categorize and re-evaluate their lived experiences. Meanwhile, the social constructivist perspective, largely rooted in the work of Lev Vygotsky, argues that intellectual growth cannot be separated from its social environment. It posits that language and cultural artifacts are the primary vehicles through which learners negotiate meaning with others (Palincsar, 1998). When synthesized, these theories re-frame students as active agents. Rather than being empty vessels to be filled, they are considered active meaning-makers,



Image 4. Source: Pixabay, 2017. Public Domain.

who constantly reconcile newly encountered information with their personal histories, cultural backgrounds, and social interactions in order to form a coherent understanding of the world (Kalina & Powell, 2009).

Ultimately, shifts in how learning is understood and conceptualized have influenced pedagogical approaches and, consequently, have important implications for the role of teachers. As views of students evolved from passive recipients of information to active meaning-makers, teaching methods began to reflect this altered perspective, paving the way for student-centered approaches such as inquiry-based and problem-based learning. In these settings, the classroom functions less as a lecture hall in which information is presented and more as a laboratory where students are confronted with challenges and encouraged to interrogate materials, debate findings with peers, and reflect on their own cognitive gaps. This collaborative construction of knowledge aims to ensure that learning emerges from 'lived experiences' rather than from rote exercise. Accordingly, these approaches position teachers as strategic facilitators

rather than sole transmitters of knowledge, a shift that brings with it a new set of high-stakes expectations for learners themselves. University students are increasingly expected to step up as primary stakeholders in their own education: they are encouraged to assume greater responsibility for their learning, take initiative, make decisions, monitor their progress, and persist through challenges. In this context, students taking responsibility for their learning is increasingly seen as both a prerequisite for and an intended outcome of contemporary education.

Although there is a broad agreement that students need to assume greater responsibility *in* and *for* their learning, what that actually looks like in practice remains somewhat unclear. It's one thing to say students should take responsibility, but it's another to define the specific attitudes and behaviors that make it happen. To bring conceptual clarity, some scholars have proposed definitions of *responsibility for learning*. For instance, in their work on teachers' professional identity, Lauermann and Karabenick (2011, p. 75) defined it as "a sense of internal obligation and commitment to produce or prevent designated outcomes". Although originally developed in the context of teaching, this definition has also been used to conceptualize student responsibility. Fishman (2014) took this a step further by making an important distinction between responsibility and accountability. While responsibility is internally driven, proactive, and self-endorsed, accountability involves being answerable to external demands, expectations, or evaluations. This distinction highlights that true responsibility for learning cannot be imposed; it must be internalized and initiated by the learner.

Moving from theoretical definitions to practical application, researchers have attempted to categorize the specific ways students demonstrate responsibility throughout their educational journey. One example is Zimmerman and Kitsantas (2005), who identified three essential dimensions: motivation, the application of learning strategies, and active engagement with the material. While this tripartite framework provides a useful foundation, it is grounded largely in studies of school-aged populations. In the specific context of engineering education at TU Delft, our exploration suggested that these existing categories do not entirely encompass the sophisticated competencies required of engineering

students. Recognizing these limitations, we conducted a comprehensive literature review and interviewed various educational experts to develop an expanded version of these dimensions. In the following sections, we will present these refined dimensions.

2.1. Operationalizing student responsibility for learning

Drawing on insights from our *100 Days of Students Taking Responsibility for Learning* program, alongside the research activities that accompanied it, we propose an expanded set of dimensions that reflect how students in higher education, particularly in TU Delft engineering education, may demonstrate responsibility for their learning. These include: (1) classroom participation and learning activities, (2) motivation, (3) metacognition, (4) making connections within and across disciplines, (5) social relations and teamwork, and (6) student involvement as co-creators of education. Further details regarding the underlying research activities, as well as specific items for each dimension, are provided on page 90 and 91.

1. **Course participation and learning activities**: Although student-centered approaches has transformed the structure and dynamics of classroom activities, classrooms still remain a critical space where much of the learning takes place, whether they are grounded on lecture-based formats or more interactive project-based settings. Studies show that participating in classroom activities is associated with various benefits. For instance, it has been associated with higher academic performance, increased motivation, and personal growth (Rocca, 2010). Such results are promising, yet any experienced educator would likely concur that not all types of participation yield comparable advantages. Our exploration has revealed that for students who take responsibility for their learning, classroom participation goes beyond mere physical presence. It involves meaningful and cognitively active engagement (Kim et al., 2020). Such active participation includes, but is not limited to, behaviors such as coming in prepared, engaging thoughtfully with course materials, asking thought-provoking questions, and showing the courage to critically engage with ideas, whether by contributing constructively



Image 5. Responsibility for learning, 2026, by Tanja Richter. Reprinted with permission.

to discussions or respectfully challenging assumptions presented by instructors and/or peers. It also involves an awareness of one's role in shaping a productive learning environment, including active listening and supporting the learning of peers when appropriate. At the same time, it is important to recognize that students may express this responsibility in different ways. For example, some may arrive well-prepared and generate insightful questions, yet choose not to share them aloud in class. Therefore, it is essential that classrooms provide multiple avenues for students to engage and demonstrate responsibility, ensuring that diverse preferences, comfort levels, and communication styles are respected and supported.

2. **Motivation**: The term motivation holds a prevalent position in everyday language, and therefore it is a highly intuitive construct, which is easy to resonate with. Yet, in educational and cognitive psychology, motivation refers to a multifaceted, complex construct – much like responsibility for learning itself. It is shaped by blend of internal and external factors ranging from students' goals, interests, self-efficacy beliefs, outcome expectations, and causal attributions (Zimmerman, 2002). Yet, simply put, motivation can still be described as the internal fuel that drives students' effort and willingness to initiate, persist in, and eventually disengage from learning activities (Pintrich & Zusho, 2007; Schunk, 2005).

   In the context of responsibility for learning, motivation may play a dual role, functioning as both a prerequisite and crucial outcome. As a prerequisite, it provides the necessary momentum for student control: students facing motivational obstacles are less likely to assume responsibility for their learning. They are less inclined to take initiative, persevere through difficulties, or engage deeply with their studies. Yet, motivation can also emerge as a result of the learning process itself. When students take responsibility for their learning, the accompanying sense of agency and control can foster a deeper commitment to their academic and professional path. This is especially true when students' responsibility taking efforts yield

tangible success and personal growth, creating a self-reinforcing cycle where the act of taking responsibility actually fuels the desire to continue doing so.

Our synthesis of teacher interviews and existing literature revealed various ways by which students can demonstrate responsibility within the motivational domain. For instance, one prevalent motivational challenge is students adopting a narrow view of their studies, typically focusing on grades or passing courses rather than developing a deeper understanding of the materials. In this context, students can take responsibility for their learning by setting more meaningful learning goals. Instead of prioritizing their exam performance, they may reflect on how the knowledge and skills they are developing can be applied in real-world contexts. Whereas exam-oriented focus may lead students to memorize facts and procedures well enough to reproduce them under assessment conditions, application-oriented focus may induce engagement with underlying mechanisms, conceptual relations, and broader applications of what is being learned.

Additionally, students who take responsibility within the motivational domain may acknowledge that course content may not always be inherently interesting. Put differently, they do not wait for course to become interesting, but instead they actively bridge the gap between the syllabus and their personal and/or professional aspirations, such as by connecting what they study and what they find meaningful. Such an approach can help students sustain engagement, even during the more tedious or demanding phases of a course. Furthermore, an important characteristic of students who assume greater responsibility for their learning is that they tend to view themselves as primary agents in the learning process. By attributing academic successes and setbacks to their own actions rather than to external factors, these students are more likely to persist through challenges instead of losing interest or being discouraged even when difficulties arise. Through these actions,

attitudes, and beliefs, students not only sustain their motivation but also deepen their sense of ownership and commitment to their learning.

3. **Metacognition**: Widely known as 'thinking about thinking', metacognition refers to one's knowledge, monitoring, and controlling of their own cognitive – thinking – processes (Flawell, 1979). In relation to students taking responsibility for their learning, metacognition plays a critical role, as it is positioned at the center of many theoretical models designed to describe students' behavior in regard to reaching their goals, particularly within the realm of self-regulated learning, such as models proposed by Nelson and Narens (1994) and Winne and Hadwin (1998). Metacognition is typically divided into three components:

   – *Metacognitive knowledge* can be described as the foundational basis that students build throughout the years through instruction and personal experiences. It is comprised of students' knowledge and beliefs about how learning occurs, how they themselves learn, their strengths and weaknesses, as well as learning strategies they can employ and the efficacy of those strategies for specific learning tasks.

   – *Metacognitive monitoring* refers to a process by which students assess their own understanding in relation to a specific goal or benchmark. It results in a continuous stream of judgments that can occur at different stages of learning, including retrospective, concurrent, and prospective judgments. For instance, students may assess whether they solved a problem correctly (retrospective), whether they have truly grasped a concept at the time of learning (concurrently), or judge how likely they are to recall information later (prospective). These judgments and their accuracy are critical, because an accurate read of one's own progress is what allows students to take effective control decisions.

   – *Metacognitive control* refers to the regulation of one's cognitive processes and learning behaviors. That is, insights derived

> from metacognitive monitoring feed into metacognitive control, and through metacognitive control, students translate their self-assessments into strategic action, thereby closing the gap between their current level of understanding and their learning goals. Metacognitive control may involve decisions about resource allocation, such as spending more time on a challenging chapter, or strategy selection, such as shifting from passive reading to active self-testing. Ultimately, it is the iterative interplay between accurate metacognitive monitoring and effective metacognitive control that enables students to remain adaptive in pursuit of their learning goals.

Students can take responsibility within this domain by developing greater knowledge of, and awareness about, their own learning processes and by more actively engaging in metacognitive monitoring and control. At the level of metacognitive knowledge, for example, students may reflect on their strategy repertoire, question what is and is not working in their study routines, and familiarize themselves with alternative learning strategies. At the level of monitoring, students can regularly assess their understanding and learning progress as well as recognize common cognitive biases that distort self-assessment, such as the illusion of knowing or fluency bias, which can lead to overestimations of understanding and preparedness (Kirk-Johnson et al., 2019; Onan et al., 2024). At the level of control, students can align their learning strategies with the demands of a given task and engage in remedial activities when their monitoring signals shortcomings.

As mentioned, a key metacognitive control decision concerns the learning strategies students choose and how they approach their learning. Such decisions are particularly consequential in engineering education – and at TU Delft in particular – where students encounter complex content and a heavy course load. Additionally, the transition from secondary school to university can be particularly challenging: while secondary education typically provides more structure and personalized guidance, higher education places greater emphasis on students managing their own learning. In this context, the learning

strategies and resources that students choose to use play a critical role not only in their academic achievement but also in their overall well-being (Bjork et al., 2013).

To learn effectively, it is critical that students use strategies that might feel more effortful in the short term but are known to support meaningful learning, i.e, so-called desirable difficulties (Bjork & Bjork, 2011). Examples include distributing study over time rather than cramming (distributed practice), actively retrieving information from long-term memory through self-testing, explanation, or flashcards (retrieval practice), and deliberately alternating between related topics or problem types instead of studying them in isolation (interleaved practice). A substantial body of research demonstrates the effectiveness of these strategies for long-term learning across domains and learner populations. Yet, it is important to recognize that students may not always be equipped with the knowledge or skills needed to adopt such strategies on their own (de Bruin et al., 2023). Many lack awareness of alternative study techniques and rely on familiar and easier but ineffective habits (Bjork et al., 2013). Therefore, fostering responsibility in this domain requires more than expecting students to self-regulate; it also involves providing them with guidance, resources, and learning environments that support the development and application of effective study strategies (Biwer et al., 2020).

4. **Making connections within and across disciplines**: When joining the workforce, engineering students will encounter problems that are inherently complex and arise at the intersection of various disciplines, requiring them to understand and synthesize knowledge and methodologies of domains beyond their own. To tackle such complex problems, students need to be able to make deliberate connections, both within their discipline and across disciplinary boundaries. Taking responsibility, here, means that students do not regard each course as a separated and isolated unit, but they seek coherence and continuity in their learning trajectory. Within disciplines, this connection entails that students integrate knowledge from different courses or topics and recognize how foundational

concepts build on each other. For instance, engineering students might connect mathematical modelling techniques learned in one course to fluid dynamics problems in another or apply theoretical principles from physics to practical design tasks.

When making connections across disciplines, taking responsibility begins with a certain attitude in which students show humility, acknowledge the limits of any single discipline, and remain open to insights and contributions from other disciplines. What follows this attitude is students' ability to integrate knowledge and methods from fields beyond their core domain. For instance, when addressing sustainability challenges, students might combine their technical expertise with ethical considerations. In this instance, while technical expertise may be developed through courses within a single discipline, their integration with ethical awareness considerations may be possible through courses from social sciences. Ultimately, this dimension of responsibility highlights the importance of transfer: connecting knowledge across topics and disciplines in ways that enable students to address complex, real-world challenges. It requires learners not only to deepen their expertise within a field but also to recognize and act on opportunities for interdisciplinary understanding and collaboration.

5. **Social relations and teamwork**: So far, in our attempt to identify how students can demonstrate responsibility in their learning, we have focused on the individual characteristics of learning – what students can do in their own learning. However, equally important is to acknowledge that learning cannot be understood as merely an individual process, since learners' attitudes and behaviors are shaped through social interactions and developed within the contexts in which they are embedded (Zimmerman, 2002). An important implication of this view is that if learning is not solely an individual process but unfolds through social relations, then responsibility for learning also extends beyond individual cognitive processes and involves building social relations. Moreover, many of the problems that students are expected to address in contemporary engineering are beyond the reach of any single individual. Instead, such problems

require collective effort, in which individuals must develop a shared understanding of the problem, negotiate different perspectives, resolve emerging conflicts, and work together in coordinated and meaningful ways (O'Connell et al., 2024). Hence, preparing students to tackle such challenges also requires recognizing the social dimension of learning, which opens new avenues for students to assume and demonstrate responsibility.

Accordingly, from a pedagogical standpoint, study groups and collaborative projects serve not only as contexts for knowledge acquisition, but also as spaces in which students should develop critical communication and teamworking skills. Here, the responsibility for learning goes beyond simply contributing to group tasks or fulfilling assigned roles; it also involves actively fostering safe, inclusive, and productive group dynamics. It can be expressed through practices, such as providing constructive feedback, listening attentively to others' perspectives, articulating shared goals, and responding thoughtfully when disagreements arise. Ultimately, this dimension of responsibility reflects a broader understanding of learning, one that extends beyond individual cognition and includes contributing to the learning, functioning, and well-being of others within the educational community.

6. **Students as co-creators of education**: Traditionally, determining many course elements, including content, assessment, and delivery modes, almost exclusively fall under the responsibility of teachers and institutions. In our exploration, however, this perception has been challenged: some teachers viewed students as co-creators, whose contribution to course design and its elements were demanded and encouraged. This implies that students have the capacity to contribute to course design in ways that benefit both their own learning and that of their peers. Although thought-provoking, the premise whether students can in fact contribute meaningfully to course design remains to be empirically tested. Nevertheless, in our exploration, we identified several ways in which responsibility for learning can be manifested by students within this domain. One such possibility is students co-designing assignments and projects

that reflect their interests while still aligning with course objectives, in contrast to assignments that are pre-determined by teachers and only performed by students. It also differs from simply offering students choices from pre-designed options; instead, students contribute to the design of assignments from an early stage, positioning them as partners in shaping the learning process. In addition to contributing to course content, other possibilities include students contributing to assessment criteria or providing structured feedback that informs how a course is taught in subsequent years. Critically, taking responsibility as co-creators requires students to move beyond a consumer mindset, where education is something delivered to them; instead, they should move toward a partnership model in which they help shape the learning environment.



Image 6. BK van boven Zuidserre [BK from above Zuidserre], by TU Delft Mediaportal, 2017, Public Domain.

3. Factors that influence students taking responsibility for their own learning

Many students, educators, and learning experience designers observe that learners vary significantly in the degree to which they are *able* and *willing* to take responsibility for their learning. This variation became a recurring theme during our 100 Days of STR activities, prompting us to reflect on the underlying conditions that either support or inhibit students in developing and showing responsibility towards their learning. To structure these reflections, we compiled the relevant factors across two interrelated levels: the student level and the course level. This structure allows us to examine responsibility not just as a personal trait, but as a relational and contextual construct that is shaped through ongoing interactions between learners and their learning environments.

3.1. Students

At the level of individual student, two clusters of factors appeared particularly salient: motivational orientation and metacognitive knowledge. While motivation can be described as the fuel that energizes student actions, knowledge determines the quality and capacity of those actions; together, they form the basis of *response-ability*.

3.1.1. Motivation

In our discussions, the Expectancy, Value, and Control Model of Motivation or EVC (Barron & Hulleman, 2015; Wigfield & Eccles, 2000) and the Self-Determination Theory or SDT (Deci & Ryan, 2002) emerged as two motivational theories that can help us explain why some students are willing to assume greater responsibility for their learning than others.

According to the EVC model of motivation (Barron & Hulleman, 2015), there are three fundamental questions that students answer, which in turn influence their choices, perseverance, and performance in academic

settings. The first question, “can I do the task?”, pertains to the **Expectancy** component of the model, which refers to students’ beliefs about their abilities to perform a task successfully, both at the moment and in the future. The central idea here is that students are more likely to engage in actions they believe fall within their competence. For instance, students who believe they can contribute meaningfully to a classroom discussion will be more likely to ask questions, make comments, or critically engage in the ideas presented in that class. In contrast, those who doubt their abilities to make worthwhile contributions may hesitate to show similar attitudes even if they are invited or expected to do so.

The second question, “do I want to do the task?”, pertains to the **Value** component, which refers to whether students find a task interesting, useful, or personally important. For instance, as described earlier, we defined *making connections* as one of the dimensions through which students can demonstrate responsibility for their learning, such as linking concepts across course modules, recognizing how methods from one discipline apply to another, or identifying how current knowledge builds on what was learned previously. When students see these connections as valuable, whether for academic progression or personal intellectual growth, they are more likely to perform them. Conversely, when the perceived value of a task is low, students may disengage or refrain from taking responsibility, even if they are capable of doing so. Moreover, in the absence of clear incentive structures, such as recognition or alignment with assessment, students may not feel that taking responsibility is worth the effort. Thus, fostering student responsibility also involves ensuring that *taking responsibility* itself is perceived as worthwhile, and that students see their contributions as meaningful and consequential.

In prior work, **Cost**, which refers to the time, effort, and resources required to perform an activity, was treated as part of the Value component. More recently, however, it has been recognized as a third distinct component. Barron and Hulleman (2015, p. 508) argues that students also consider the question “am I free of barriers that prevent me from investing time, energy, and resources into an activity?” By its nature, cost differs from expectancy and value: while these two factors can motivate students toward taking responsibility for their learning, cost

can inhibit that motivation, even when their ability and perceived value are high. For example, students often have multiple goals and interests beyond academics, such as maintaining social relationships, meeting financial obligations, or managing personal well-being. Some of the dimensions and behaviors we associate with student responsibility, such as preparing thoroughly for group work or contributing to course design discussions, can require significant time and cognitive effort. If students perceive that these investments would interfere with other valued goals, they may choose not to engage, even when they are both capable of and interested in doing so. In this way, a high perceived cost can act as a silent barrier to responsibility taking.

In addition to the EVC constructs, our conversations highlighted the importance of the social and emotional climate of the learning environment. Specifically, creating a space that is psychologically safe and inviting, and fostering trust among all actors in higher education (students, teaching assistants, and teachers) emerged as critical preconditions for students to take responsibility for their learning. One theoretical lens that captures these factors is the Self-Determination Theory (SDT), which also featured repeatedly in our conversations.

According to the SDT (Deci & Ryan, 2012), students are more likely to engage in motivated behavior when their three psychological needs are supported and fulfilled. These needs are as follows:

– Competence: the need to feel capable and successful.
– Autonomy: the need to feel in control and that one's actions are self-chosen.
– Relatedness: the need to feel connected to others, to be respected, and to belong.

Then, the objective of classroom and instructional design becomes helping students fulfill these needs. For instance, psychological safety and a trusting environment, which are associated with the need for relatedness, are considered essential for students to take responsibility for their learning. While there is no single or easy recipe to meet these needs, one can consider whether students are provided with sufficient

opportunities to make mistakes and whether failure is normalized by peers and teachers. Similarly, motivation can be expected to increase when teaching and learning activities provide students with a sense of accomplishment and help them recognize improvements in their skills and knowledge (competence), which can be supported through timely feedback and formative assessment (Rakoczy et al., 2019). As for autonomy, students can be given meaningful choices, such as selecting learning pathways, assessment formats, or topics of study (Evans & Boucher, 2015). Together, these conditions create an environment in which responsibility for learning can emerge not as a burden, but as a natural outcome of feeling capable, empowered, and connected.

3.1.2. Knowledge and abilities

Although motivation can be viewed as a necessary condition for students to take responsibility for their learning, it may not be sufficient by itself. Students should also know how to take responsibility for their learning. In this view, taking responsibility is not only a matter of will, but also of students' capacity to act proactively and effectively when shaping their learning processes.

This capacity can be grounded in several forms of (meta)cognitive knowledge (Veenman, 2015): knowledge about oneself (e.g., one's strengths and weaknesses), knowledge about learning (e.g., which strategies are effective and how performance is evaluated), knowledge about the content (e.g., depth of understanding or expertise in a subject area), and knowledge about the broader educational context (e.g., institutional norms or expectations in student-teacher relationships). In what follows, we describe each of these knowledge domains and illustrate how they shape students' capacity to take responsibility for their learning.

In this context, knowledge about oneself refers to students' understanding of themselves as learners. Specifically, this knowledge may range from students' awareness of their strengths and weaknesses, motivational triggers, tendencies, and areas for improvement (e.g., knowledge gaps).

Evidently, such knowledge is critical for various reasons; however, we would like to highlight its role in proactivity, as proactivity emerged as a critical feature of responsible action toward learning in our conversations. Proactivity can be described as an approach that is self-initiated, anticipatory, and entails goal-oriented change in one's learning. This approach, however, requires an accurate and realistic understanding of one's strengths, weaknesses, and limits. Consider a student who knows that they tend to procrastinate when tasked with difficult assignments. This student can anticipate this challenge and act accordingly, for example by breaking the task into smaller steps, setting intermediate deadlines, or seeking early feedback or external help. In this way, self-knowledge provides the basis for taking informed and deliberate action.

Knowledge about learning refers to how well students understand the cognitive and physiological mechanisms of learning. At face value, this knowledge may seem counterintuitive, since students might be expected to develop a strong understanding of how learning works, given that they all go through many years of schooling. Yet, a wealth of research shows that students, and even educators, often hold limited or even mistaken understandings of learning (de Bruyckere et al., 2015). For instance, one common misconception is the failure to distinguish between performance and learning. Whereas performance can be described as immediate, context-specific success, learning refers to relatively enduring changes in knowledge structures, skills, and beliefs (Soderstrom & Bjork, 2015). When students confuse performance with learning, they may overestimate their progress and overlook remedial activities that are necessary to improve their learning. An example of this is when students are able to solve problems immediately after instruction and believe that they have mastered the underlying principles, yet fail to solve similar problems after some time. Other widespread myths include the belief that individuals learn best when instruction matches their "learning style", or that people are innately either "left-brained" (logical, mathematical) or "right-brained" (creative, visual) (de Bruykere et al., 2015). These misconceptions are not merely harmless; they can discourage students from using effective strategies for long-term learning and lead them to attribute learning difficulties to fixed traits rather than to mendable strategies and effort (de Bruykere et al., 2015).

An important implication of the abovementioned misconceptions is that students can benefit from learning about how learning works and how to learn (Bjork et al., 2013). This includes not only knowing and applying effective study strategies such as retrieval practice, interleaving, elaboration, and self-explanation, but also acquiring skills to search for information, judge its credibility, and integrate it meaningfully into their work. Importantly, it is not simply the use of strategies or tools that matters, but the knowledge of when and why to apply them – a capacity referred to as conditional strategy knowledge (Paris & Paris, 2003). For instance, a student might use retrieval practice to consolidate knowledge before a cumulative exam, but rely on worked examples when first encountering a complex concept in physics. In essence, understanding how learning works and how to learn allows students to take responsibility for their learning in informed and strategic ways.

Taking responsibility for learning also depends on students' understanding of the subject matter itself. Note that this type of knowledge is not limited to recalling facts or formulas, but also extends to recognizing patterns, connecting concepts, and applying domain knowledge flexibly in novel contexts (see the dimension *making connections within and across disciplines*). For example, an engineering student working on air quality sensors may need more expertise than just technical expertise in electronics and data analyses. Ideally, they should also understand how measurement standards are defined in public health and how data can inform policy decisions. Taking responsibility within such a task requires a substantial knowledge base that spans engineering, health sciences, and environmental studies. In this sense, responsibility in regard to content knowledge is not limited to mastering disciplinary facts, but extends to recognizing when expertise from other domains may become necessary to evaluate trade-offs and anticipate wider consequences.

Finally, students' desire and capacity to take responsibility for their learning are shaped by their understanding of the educational norms, expectations, and "the rules of the game". This knowledge, however, can go both ways. For instance, the context itself can constrain or discourage students from taking responsibility for their learning. For instance, overreliance on summative exams may lead students to adopt surface-level strategies such as cramming, enabling them to pass an exam without genuine learning. Likewise, group assignments that overlook individual contributions and efforts may create opportunities for "freeriding", discouraging students to take individual and shared responsibility. By contrast, students are more likely to take responsibility for their learning when they know that such behavior is explicitly incentivized and rewarded within their educational environment. Recognizing these dynamics constitutes an important form of contextual knowledge, as it allows students to understand how structural conditions shape their choices and actions.

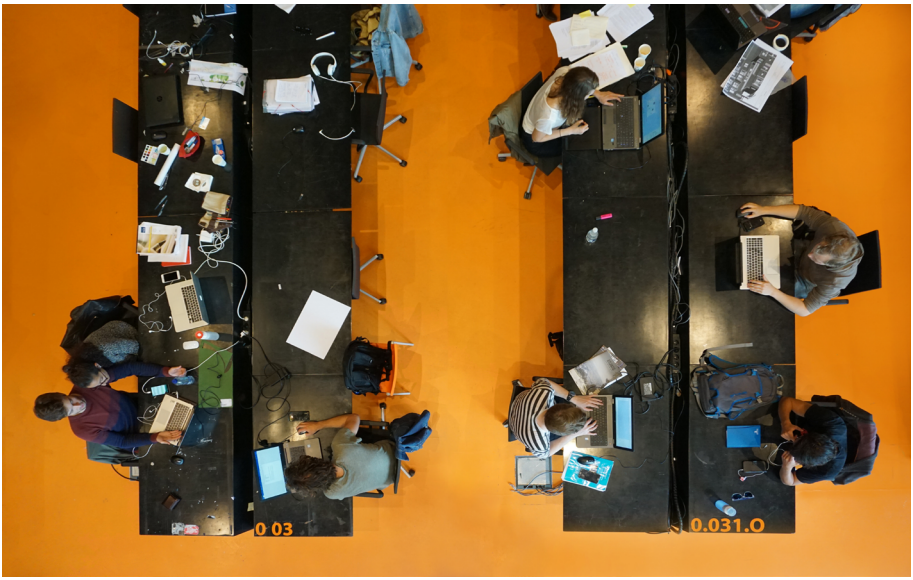


Image 7. BK van boven Oostserre [BK from above Oostserre], by TU Delft Mediaportal, 2017, Public Domain.

3.2. Course level

So far, we have described motivational and knowledge-based factors that can either facilitate or hinder students in taking responsibility for their learning. While these factors are primarily situated at the student level, it is important to acknowledge that such individual factors can be heavily influenced by external factors, specifically from those associated with course design. We structure these factors around three levers: pedagogical approach, instructional methods, and assessment design.

3.2.1. Pedagogical approach

Ideally, every course is designed around a guiding theory and philosophy that shapes how teaching and learning activities, as well as assessment methods (also called the pedagogical approach) are organized. Such choices can be implicit, yet they are rarely random: they are influenced



Image 8. Source: iStock, 2019. Public Domain.

by several factors, such as teachers' beliefs about human development and learning, the subject matter, course objectives, and practical considerations like class size, facilities, or scheduling.

Although the detailed description of each specific pedagogical approach is beyond the scope of this book, from a practical point of view, at the course level, we can consider a spectrum. At one end of this spectrum are inquiry-based approaches, such as project-based, problem-based, or challenge-based learning. All these approaches emphasize authentic learning tasks, whether based on fictional scenarios (e.g., low-fidelity problem-solving cases) or developed by students in collaboration with external stakeholders (a defining feature of challenge-based learning). A key aspect of these approaches concerns how responsibility is distributed between students and teachers: while teachers primarily play a facilitator role, students are expected to actively seek knowledge and manage their own learning. At the other end of the spectrum are more direct instructional approaches, in which teachers provide structured explanations and guided practice. Here, the responsibility for learning may look different, as teachers may still assume a prominent role in organizing content, sequencing tasks, and monitoring students' progress. Meanwhile, students may essentially be responsible for active and attentive engagement, as well as the consolidation and application of the provided material. Responsibility is therefore not absent, but may be expressed in a different manner.

Taken together, these examples illustrate that pedagogy is never neutral. It shapes not only how teaching, learning, and assessment are carried out, but also how learning objectives are defined and how responsibility for learning is distributed between teachers and students. At the same time, pedagogical choices influence students' motivation. Inquiry-based approaches, for instance, can boost motivation by giving students greater autonomy and by engaging them in authentic tasks that feel relevant to the world beyond the classroom (Wijnia et al., 2024). Yet these same approaches can also overwhelm students if the number of choices feels excessive or if they doubt their ability to build the necessary competence (Wijnia et al., 2024). Similarly, direct instruction may initially appear less motivating, but it can foster confidence and persistence by

providing a clear structure and by helping students experience success in mastering foundational knowledge. In this sense, the relationship between pedagogy, motivation, and responsibility is complex: different approaches create different motivational affordances, each of which can either support or constrain students in taking responsibility for their learning.

3.2.2. Instructional methods

The extent to which students take responsibility for their learning is also influenced by the instructional methods used in the classroom. Instructional methods refer to techniques or approaches through which teaching and learning activities are organized and enacted. These decisions may include:

- students work in groups or individually,
- students engage in peer feedback,
- new materials are studied before class, as in a flipped classroom model, or
- how learning activities are spread across different mediums (face to face versus online).

Each of these choices may influence the degree and form of responsibility that students may take in their learning. For instance, group projects may lead students to take responsibility in the social dimension by requiring students to negotiate roles and coordinate tasks. Similarly, peer feedback may lead students to take responsibility in the metacognitive dimension, as students must evaluate others' work while critically reflecting on their own. However, if these methods are poorly structured, they can discourage students from taking responsibility. For example, group work may create opportunities for some students to become "freeriders", while peer feedback can lose its value if students perceive the comments they give or receive as superficial or of low quality.

From a motivational standpoint, instructional approaches that facilitate meaningful interactions and collaboration among peers often enhance

a sense of relatedness, while giving students opportunities for choice can boost their autonomy. Conversely, too much ambiguity or insufficient guidance can leave students feeling lost, which may undermine their sense of competence. Therefore, it is essential for instructional methods to find a balance: they should create opportunities for students to take responsibility for their learning while also providing adequate support and guidance.

3.2.3. Assessment design

Assessment is arguably the most influential factor in signaling to students what matters in a course, and it strongly shapes how they approach their learning. Yet, a central challenge for educators is whether current assessment methods capture, or even target, the extent to which students take responsibility for their learning. This is where the principle of constructive alignment becomes particularly relevant. Constructive alignment emphasizes coherence between intended learning outcomes, teaching and learning activities, and assessment. If responsibility for learning is to be treated as a genuine objective, it must first be articulated in course outcomes and then reflected consistently in teaching activities and in the ways students are evaluated.

However, most existing practices still rely heavily on summative assessments, such as final exams or standardized tests, that focus primarily on end products. While such methods have their strengths, they often encourage short-term, performance-oriented strategies like cramming, rather than supporting deeper or longer-term learning, or other ways through which students can demonstrate responsibility for their learning. Responsibility, as we understand it, extends beyond content mastery and is expressed across several dimensions, such as metacognition, social relations, and co-creation. For example, metacognition can be evidenced through reflective journals or learning logs that capture how students monitor and regulate their own progress, while responsibility in social relations might be demonstrated through peer feedback or group evaluations that highlight how students contribute to collaborative work.

To capture these broader dimensions, approaches such as formative assessments, reflective portfolios, and authentic tasks shift attention from outcomes alone to the learning process itself. Nonetheless, important questions remain: how can responsibility across its different dimensions be meaningfully assessed, and what kinds of evidence should be collected? These open questions highlight that assessment design is not only about aligning outcomes and activities, but also about developing new, evidence-informed methods for evaluating responsibility as an integral part of students' learning journeys.

4. Supporting students to take responsibility for their own learning: Illustrative cases from TU Delft

If responsibility for learning is to be taken seriously, it cannot be expected to emerge on its own. Students need structured opportunities, encouragement, and carefully designed environments that allow them to practice and gradually develop this responsibility. At TU Delft, many educators are already experimenting with interventions that provide such support. In this section, we highlight several of these initiatives. They serve both as concrete examples of how responsibility can be fostered in practice and as inspiration for further exploration across our university.

Case 1: Skill Circuits on Study Techniques

Dimensions: metacognition, learning strategies

Upon entering higher education, students often struggle to manage the demands of a complex study load, partly due to suboptimal study habits, such as relying on ineffective strategies for long-term retention and transfer. Many students also lack metacognitive awareness of effective study techniques or have difficulty accurately assessing their own learning. To address these challenges, this project offers a scaffolded skills circuit in which students are introduced to evidence-informed learning strategies and are given structured opportunities to explore, apply, and reflect on these techniques.

Case 2: Students choosing their own learning journey

Dimensions: motivation, metacognition

Classrooms often consist of students with varying levels of prior knowledge. However, this variation is not always sufficiently accounted

for in course design or learning activities. As a result, students with high prior knowledge may become disengaged due to a perceived lack of challenge, while those with low prior knowledge may struggle to keep up. This project demonstrates how student needs can be met through personalized learning trajectories. By allowing students with different levels of prior knowledge to follow differentiated learning paths, while still receiving appropriate guidance, the project aims to support more effective and inclusive learning experiences.

Case 3: Curiosity-driven education

Dimensions: motivation, course participation

Although students' needs and interests often evolve throughout a course, curricula typically offer a static learning path with a pre-determined content and activities. This raises an important question: how can we account for the dynamic nature of student interests and needs? This project addresses the issue through a flipped classroom approach, allowing students to proactively explore course materials and formulate questions in preparation for subsequent theory sessions. By doing so, classroom time is freed up for deeper engagement, and the content can be shaped by the question that students put forward.

Case 4: Teaching Assistants' professionalization through co-creation

Dimensions: learning approaches, co-creation, motivation

Teaching Assistants (TAs) often serve as the first point of contact for students and play a key role in shaping the learning environment. Despite their central position, TAs are frequently underprepared for the complex interpersonal and instructional demands of their role, especially in areas such as critical thinking, effective communication, and facilitating collaboration. This project offers a series of co-created workshops

designed to support TAs in developing these essential skills. In doing so, both TAs and their students benefit, contributing to a more supportive and reflective learning community.

Case 5: Social relations, co-creation, course participation

Creating a safe and open learning environment, where students feel accepted for who they are, comfortable sharing their thoughts, and able to participate in classroom activities without fear of judgment, while also engaging meaningfully with their peers, is essential not only for academic success but also for student well-being. Research has consistently shown that when such conditions are present, students are more motivated, less likely to drop out, more deeply engaged with course materials, and better equipped to adopt a critical and reflective stance toward their learning. This project demonstrates how a trusting and inclusive classroom climate can be cultivated through a social code of conduct developed collaboratively with students.

Case 6: Students as Partners in Co-creating Education (SPiCE)

Although many educational innovations aim to improve student experience, the student voice often remains underrepresented in their design and implementation. The SPiCE project aims to address this gap by engaging students from all TU Delft faculties as partners in shaping education. This project demonstrates how student-led teams, supported but not steered by staff, can co-create meaningful outcomes, from whitepapers and student research to organizing feedback sessions. By taking the ownership of both process and product, SPiCE illustrates how mutual trust and increased student autonomy may enable students to generate fresh insights, challenge assumptions, and develop skills that go beyond what they develop during their studies.



Image 9. BK van boven Atelier [BK from above Atelier], by TU Delft Mediaportal, 2017, Public Domain.

5. Call to action

Higher education increasingly calls upon students to take greater responsibility for their learning, yet what this responsibility entails often remains unclear. In this book, we explored what it means for students to take responsibility for their learning and why this matters. Crucially, we approach this goal not as an isolated demand placed solely on the shoulders of students, but as a shared educational endeavor shaped by multiple actors, including students, teachers, and institutional structures, as well as by contextual elements such as course design and specific instructional choices. Accordingly, the primary purpose of this book was to provide conceptual clarity and practical direction for this widely endorsed yet often loosely defined objective.

We recognize that responsibility for learning concerns all those who participate in education, albeit in different roles and with different forms of influence. Therefore, we conclude this book with a series of open letters to students, teachers, and program coordinators. These letters do not offer final answers, but rather extend an invitation to continue the dialogue and to consider how responsibility for learning can be supported collectively in the educational communities we inhabit. Before turning to these letters, we pause for several reflections.

Although this book is called “students taking responsibility for their learning”, a central message running through this work is that responsibility for learning does not rest with students alone. Rather, it is our position that responsibility for learning emerges through the interaction between individual capacities, educational practices, and institutional environments. Therefore, rather than advancing a single definition of student responsibility, we have sought to illustrate the diverse ways through which responsibility for learning can be manifested across contexts. Making these dimensions visible invites both educators and students to recognize which forms of responsibility are meaningful, feasible, or underdeveloped in their own settings, and to reflect on why this may be the case.

Additionally, we note that there are no single solutions to complex problems. Therefore, we do not aim or attempt to offer ready-made solutions or universal prescriptions. Instead, we seek to support teachers, students, and educators in examining their own contexts and considering how influential factors, such as student readiness (in the form of motivation, knowledge, and skills), educational practices, and design choices, may enable or hinder students in taking responsibility for their learning. By showcasing several existing instructional practices and mapping these practices to specific dimensions of responsibility for learning, we aim to emphasize that many supportive elements are already present in our current educational contexts. Importantly, however, these practices are highlighted to offer inspiration for contextual adaptation rather than immediate adoption. They should, therefore, be read as working hypotheses for design rather than definitive, empirically proven solutions, eventually inviting future research and systematic evaluation.

One final remark concerns the development of this book. We acknowledge that any specific understanding of student responsibility is shaped by fundamental assumptions regarding learning, knowledge, and human development – assumptions that may or may not be shared by all. For instance, our view of the learner influences what we believe students are capable of and how much agency they should exercise. Resolving these differing views is an immense challenge, if not impossible. Considering this complexity, we note that this book is the result of a joint effort by authors with diverse experiences, assumptions, and emphases. Consequently, the ideas presented here should not be interpreted as representing complete consensus. Instead, this plurality mirrors the very challenge of investigating complex social constructs that resist singular definitions and, instead, invite ongoing dialogue.

To lecturers

In this book, we have highlighted that responsibility for learning can take many forms, yet not all of them may be equally relevant or feasible in a given context. Therefore, in our account, a meaningful starting point

for lecturers is to reflect on what taking responsibility for learning means within their own courses. We see particular value in asking questions such as: what kinds of responsibility are expected from students? What kinds of responsibility are students expected to develop throughout their courses?

Recognizing that many factors may influence how students approach their learning, we encourage reflections on student characteristics as well as course design. Practically, examining student characteristics can begin with small steps, such as identifying motivational profiles, inviting students to explain what they find valuable, difficult, or unclear, or diagnosing gaps in their knowledge and skills. At the course level, such reflections may involve reviewing how learning objectives are communicated to students, considering whether teaching and learning activities invite students to take responsibility for their learning (rather than mere compliance), and whether assessment activities signal opportunities for growth rather than solely judgment.

Another helpful step is to express implicit assumptions, both your own and those of your students, about what taking responsibility for learning looks like. These assumptions often remain unspoken, yet they shape expectations and interpretations of student behavior. Creating moments for dialogue, whether within teaching teams or with students themselves, can help reveal these blind spots and open space for shared understanding.

To students

The work presented in this book is derived from a series of workshops and research activities carried out within the initiative called “Innovating Delft Engineering Education” (IDEE), specifically within the theme Students Taking Responsibility for their Learning. These workshops and research activities are conducted with your peers, educators, program coordinators, educational science researchers, and learning designers, with the intention to support you in preparing for the challenges you will likely encounter, not only during your studies but also when you join the

workforce and beyond. Therefore, our main objective does not concern academic success at the present, but explore how to support you with strategies, knowledge, and ways of thinking that will hopefully serve you long after graduation.

Accordingly, expectations surrounding responsibility for learning should not be experienced or interpreted as a burden or demand solely placed on your shoulders. Rather, they reflect a broader commitment within our community to better understand how this responsibility for learning can be demonstrated across diverse contexts, what factors may foster or hinder your engagement, and how you can be supported throughout your academic journey. Therefore, it is our hope that you perceive the very existence of this work as a signal of collective effort and genuine concern for creating learning environments that help you grow.

In practical terms, one fruitful first step may be to reflect on the dimensions of responsibility for learning and consider the extent to which those dimensions resonate with your experience. As part of this reflection, you might ask yourself various questions:

– Which aspects do feel natural to you? Do you consider them as part of your responsibility, and if so, to what extent you show them in your actions and attitudes?

– In what aspects do you believe you can take on more responsibility in your learning or contribute to the learning environment around you?

– Which aspects feel challenging? Do you have concerns and reservations? What are the root cause of such challenges, concerns, or reservations?

It is also worth noting that various internal and external factors may play a role and prevent you from adopting responsibility in your learning. Such obstacles are common and valid. For instance, internal factors may range from motivational fluctuations and gaps in prior knowledge and learning strategies. Note that identifying such challenges is not a sign of failure and does not signal incompetence, but rather serve as a starting point for seeking support, adjusting approaches, or experimenting with

new strategies. Taking responsibility for your learning does not mean that you do everything alone. It also includes understanding when to seek help and knowing where to turn.

As for external factors, such as issues related to course or instructional design, we understand that you may feel there is very little you can do – which may indeed be the case. There might be power imbalances, and it can be challenging to raise concerns or provide feedback on such matters. On the one hand, even small actions can sometimes make a difference, such as such as sharing constructive feedback through course evaluations or seeking clarification from instructors when expectations or purposes are unclear. These steps may not lead to immediate change, but can initiate a dialogue and result in gradual improvement. On the other hand, the ideas presented here are not intended as tools for criticism or confrontation, but rather as prompts for reflection and constructive communication; the ultimate purpose being to support awareness and dialogue.

To program coordinators and educational leaders

While responsibility for learning is often discussed at the level of students and courses, we believe its development is deeply contextual, that is, influenced by program level decisions. The structures you oversee, e.g., curriculum alignment and assessment policies, create conditions in which teachers and students interpret what responsibility for learning entails in practice. Thus, responsibility for learning is embedded within the broader educational architecture that surrounds them.

At the program level, an important starting point is to consider how existing structures and norms enable or constrain students' opportunities to take responsibility for their learning. Such reflections may not necessarily require or result in large-scale reforms, yet even small, gradual adjustments, such as ensuring coherence between courses, clarifying shared expectations across teaching teams, and

creating opportunities for an open dialogue on student responsibility may signal to the community that this is a shared goal and it is valued as a developmental process rather than a one-time demand.

Crucially, helping students to develop responsibility for their learning requires institutional support, not only for students but also for teachers. Teachers often need time, recognition, and professional dialogue to experiment with new approaches, and program-level coordination can play a crucial role in making such support visible and sustainable.

Another helpful step is to encourage dialogue across stakeholders (teachers, students, and support staff) so that implicit assumptions about responsibility and guidance can be discussed. These conversations do not have to aim for perfect consensus; instead, their value lies in building shared awareness and reducing fragmentation between courses and expectations. Ultimately, it is our position that responsibility for learning is less a fixed outcome than an evolving culture. Your role in shaping policies, aligning practices, and fostering communication positions you uniquely to nurture this culture over time.

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Image 10. Tanja Richter. (2026).

In lieu of author bios

This book is authored by Erdem Onan, Ted Adrichem, Serdar Aşut, Margreet Docter, Olga Ioannou, Remon Rooij, and Aleksandar Staničić, all core scientific members of the Innovation in Delft Engineering Education (IDEE) initiative.

IDEE was established to advance engineering education in response to evolving societal needs and future challenges, guided by research. The initiative brings together scientific staff, PhD candidates, postdoctoral researchers, and learning developers to integrate innovation and research, aiming for a lasting impact on engineering education. Its work spans multiple educational themes, each inspired by didactic and pedagogical challenges relevant across all disciplines at TU Delft.

One of these themes, “Students Taking Responsibility for Their Own Learning Process,” focuses on fostering autonomy and accountability in learners. Taking responsibility and acting autonomously are essential competencies for professional engineers and their future contributions to society, and they play a crucial role in promoting intrinsic motivation. This theme explores how to create the conditions that enable students to take ownership of their learning. These conditions relate to students, lecturers, the curriculum, and the broader learning environment. Key questions addressed include: What do students need in order to take responsibility? How can curricula be designed to support this? And how can lecturers effectively encourage and facilitate student ownership of learning?

Appendix A.

Detailed description of cases

1. Skills Circuit on study techniques



Case owner:

Stefan Hugtenburg

Faculty:

Electrical Engineering, Mathematics, and Computer Science

Dimensions:

Meta-cognition, learning strategies

Context and motivation

Within the Computer Science & Engineering (CSE) bachelor's program at TU Delft, students are rigorously trained in programming, algorithmic thinking, and professional skills like writing and presenting. Yet, despite access to high-quality learning materials, pass rates remained lower than expected.

As both a lecturer and first-year coordinator in the CSE teaching team, Stefan Hugtenburg began to suspect that content delivery was not the issue. Instead, it was the lack of explicit instruction in how to study that left many students under-equipped to succeed. While students were expected to "figure out" effective strategies over time, there was no structured support for metacognitive development, self-regulated learning, or reflection on learning behaviors.

This realization led to the development of a *Skill Circuit* dedicated to study techniques, strategies, and habits. The goal was to help students understand what effective studying looks like and to support them in becoming more responsible, reflective learners who can plan, monitor, and adapt their learning behaviors over time.

Practice in action

The Skill Circuit is a digital learning module designed to guide students through the essential building blocks of academic learning: techniques, strategies, and habits. It is not tied to a specific course but is referenced in various parts of the CSE curriculum, including the first-year Mentorate course (CSE1000) and Reasoning & Logic (CSE1300), and the second-year Algorithm Design course (CSE2310).

The circuit is structured around three thematic layers:

- Techniques: What can a student do in a 30-minute study session to make learning effective? This section introduces the Feynman technique, flashcards, and pair programming, while highlighting the shared principle of desirable difficulty.
- Strategies: How does one structure studying across days, weeks, or months? Topics include spaced repetition, planning, dealing with procrastination, and interleaved practice. All this aims to help students plan learning activities that enhance retention and reduce stress.
- Habits: Drawing from the book *Atomic Habits*, this section focuses on shaping the study environment, both physical and digital. It covers the impact of device use, the value of community, and the underestimated power of sleep as a learning tool.

Materials include blog-style readings, video clips, short assignments, and guided reflection prompts. Students are encouraged to engage at their own pace. Importantly, there is no fixed timeline for participation. The creator noted that some students benefit from this resource early on, while others only seek it out after experiencing academic difficulty. This flexibility honors students' differing readiness to engage with non-disciplinary content.

Although the resource is openly available, its non-compulsory nature poses a challenge. Since it carries no immediate ECTS reward, students must be intrinsically motivated or guided by teaching staff to engage. The team continues to explore ways to embed the content more firmly within the program without formalizing it into a graded component.

Reflections and results

The initiative is still early in its implementation. As such, no formal measurement of learning outcomes has been conducted. However, student feedback suggests that those who engage with the material find it meaningful. During the design phase, several students offered input on drafts, and one student in particular demonstrated the kind of reflection the resource aims to foster.

This student, already performing well academically, sent a series of reflective emails detailing how they had been experimenting with new strategies, tracking their own progress, and even adjusting lifestyle habits to improve cognitive functioning. The student's proactive mindset and careful documentation exemplified what the Skill Circuit is designed to encourage: intentional, self-aware learning and taking academic development seriously.

From an instructor perspective, the project has offered its own challenges, especially around time investment and sustainable content development. However, the potential for long-term benefit remains strong. By offering a toolkit for academic self-reflection, the Skill Circuit makes it easier for students to take responsibility for not only what they learn, but how they learn.

Insights

This case reinforces a vital insight: students need to be taught how to study just as much as they need to be taught disciplinary content. By explicitly addressing study strategies, habits, and planning, educators can give students the means to take responsibility for their own learning and academic success; not by chance, but by design.

Testimonial (by educator)

"I exchanged with a student who was already doing well, but clearly invested time and thought into streamlining their study process. Their reflections showed a deep interest in learning how to learn."

2. Curiosity-driven education

Case owner:

Santiago Garcia

Faculty:

Aerospace Engineering

Dimensions:

Motivation, course participation



Context & Motivation

Rather than receiving content in a traditional lecture format, first-year students in Aerospace Materials (AE1108-I) encountered something different: students were invited to participate in a learning experience that placed their own questions and curiosity at the core.

Driven by a desire to move beyond last-minute exam preparation stemming from the familiar issue of students going into “survivor mode” to pass courses, Santiago Garcia was motivated to get students into the right learning mode through creating an engaging framework to accommodate for this.

The course redesign aimed to promote responsibility not by adding pressure, but by promoting engagement through thoughtfully introduced, well-structured freedom, peer interaction, and curiosity-driven learning. Students were architects of their own learning experience, with opportunities to take ownership of content, develop agency, and explore ideas driven by curiosity rather than obligation.

Practice in action

The core of the approach was simple yet innovative: lectures were delivered based on students’ submitted questions in advance. Each session became a co-created space, shaped by what students were genuinely curious about.

Preparation was flexible. Students could watch video content, read relevant book chapters, or explore both, but what they got out of the session depended entirely on their willingness to engage and ask questions. To ensure that diverse learning preferences were supported, multiple learning paths were provided: video lectures with time-stamped references to textbook chapters, structured weekly plans with suggested time allocation, and supplementary lab demonstration videos. Students could tailor their engagement, but the scaffolding was clear and consistent.

Additionally, the course included problem-solving sessions with TAs, PhD-level guest lectures, and a structured weekly study workflow to support different learning paths. Students could choose how deeply to engage, but those who did were rewarded not with extra points, but with a stronger sense of connection, confidence, and clarity in their learning.

Beyond this, a Discovery Question stream was offered for exploration far beyond the exam syllabus. Voluntary and group-based, the Discovery Question invited students to delve into unfamiliar, often cutting-edge aerospace topics. Over five weeks, they collaborated, shared, refined, and ultimately presented their findings in a festive final gathering, with teachers and TAs supporting them as guides.

While the course rewarded effort symbolically, with stickers for Discovery Questions, grades were based solely on the final exam. This reinforced the message that genuine effort and responsibility were expected, not externally imposed.

All of this was delivered within the 3-ECTS workload, with the voluntary elements layered carefully to preserve student choice. Communication was handled primarily through Brightspace and email, and some logistical adaptation was required to accommodate varying participation levels, particularly in the Discovery track. Despite these complexities, the approach proved to be manageable and adaptable.

Reflections and results

For many actively students, the course stood out as one of the most meaningful in their program. They discovered not just what to learn, but how to learn. Some came back later to express how much it had shaped their study habits and outlook. The voluntary components, while demanding to organize, created moments of shared joy and insight, from pizzas and laughter at the Discovery finale to intense student-led discussions on niche topics.

Of course, the shift also brought challenges. Not all students were ready to adapt, and participation was uneven. Out of 500 students, around 50 completed the full Discovery track. Some struggled with the self-regulated structure, and a minority failed to recognize the existence of live lectures, despite serious communication efforts.

On a practical level, the teaching team also navigated challenges related to scheduling. With the course taking place late on Thursdays and with voluntary components on Fridays, participation occasionally conflicted with students' weekend plans. Still, the energy, creativity, and peer interaction generated in the Discovery track demonstrated that this approach could foster a culture of effort and reflection even in large cohorts.

Insights

This case illustrates how student responsibility can be designed from the start, through autonomy-supportive structures, meaningful choices, and opportunities for co-creation. When students are treated as partners in learning, they often respond with curiosity, maturity, and depth. While the path is not always smooth, the impact can be both lasting and profound, both for students and for educators.

Testimonial (by student)

"At the time I struggled, but now I see this was the course that taught me the most about how to truly study."

3. Co-creating a Social Code of Conduct

Case owner:

Ilke Ercan

Faculty:

Electrical Engineering, Mathematics, and Computer Science

Dimensions:

Social relations, co-creation



Context and motivation

In the BSc Electrical Engineering (EE) program at TU Delft's Faculty of Electrical Engineering, Mathematics and Computer Science, first-year bachelor students participate in a broad introduction to their field through the course Introduction to Electrical Engineering (EE1G1). This lecture-based course is integrated with the department's mentorship program and runs in parallel with lab- and project-based courses hosted in Tellegen Hall, the largest educational lab in the faculty, accommodating up to 100 students at once. Students spend nearly a full day each week in this shared space, working closely with peers on projects and lab activities. The intensity of this schedule, coupled with the collaborative nature of the work, makes the social climate of the lab especially significant for students' learning and sense of belonging.

Upon arriving at TU Delft, Ilke Ercan observed something troubling: a number of students appeared disengaged, avoided the lab space, or reported inappropriate behavior by peers. Some lacked clarity on what was socially acceptable in a diverse, multicultural academic environment. These issues extended beyond academic performance. They affected students' willingness to participate and their broader sense of belonging.

The initiative that followed, the Social Code of Conduct (SCC), was created to help students take responsibility not only for their learning, but for the social conditions in which learning happens. It aimed to support

the development of agency, self-regulation, and ownership by inviting students to actively shape the behavioral expectations that define their shared environment.

Practice in action

The SCC was first introduced in 2021-2022 in collaboration with the TU Delft Diversity and Inclusion Office and Social Integrity Office. At that time, students were asked to sign the SCC before participating in lab sessions, alongside the existing Academic Code of Conduct. It was also physically displayed on posters in the lab.

In its first year, however, the approach met resistance. Some students refused to sign, and the document was seen as too long and abstract. This prompted a change in approach. In 2023-2024, the SCC was integrated into the first-year mentorship program linked to EE1G1 with guidance from the Reflective Engineer2 program at TU Delft.

The new process unfolded as follows:

– Week 1: Students took part in a two-hour mentorship session focused on personal and professional values based on “Value Gathering” and “Value Shaping” exercises developed by the Reflective Engineer program.

– Week 2: Students were introduced to TU Delft’s values and the Social Code of Conduct. They then compared these institutional values to their own reflections, identifying where they aligned or conflicted.

This structure gave students space to discuss difficult topics, such as what constitutes respectful behavior, and how norms should be upheld in a shared lab. Students provided concrete feedback and examples to revise the SCC’s content, particularly regarding acceptable and unacceptable behaviors. Based on this feedback, the SCC was redesigned to be more visual, and now includes QR codes that link to the full text.

Throughout the process, students acted both as co-creators and participants. With guidance from the BSc EE Mentorship Coordinator, Riëlle Hondelink, mentors facilitated these exercises and supported

students in reflecting on values and behaviors in practice. The SCC is now treated as a "living" document, revisited and refined annually. Teachers and mentors facilitate the process, but students actively shape the environment they are expected to uphold.

Reflections and results

The outcomes of this shift in practice are already visible. Students have become more aware of the behavioral expectations in Tellegen Hall, and are more open to discussing social and professional values. Fewer students withdraw from the lab environment, and participation has improved. This improvement is particularly meaningful given that students are required to spend extended hours in Tellegen Hall each week. Because teamwork and shared use of the lab are integral to the curriculum, establishing clear, co-created behavioral norms has a direct impact on both academic outcomes and student well-being.

Students have shared that the redesigned SCC feels more accessible. In mentorship sessions, they contributed concrete case examples which were then integrated into the text. A comment that the SCC contained "too much text" directly influenced the visual redesign, demonstrating how student input helped reshape the tool.

One particularly striking moment illustrated the tension (and the potential) of this approach. A student initially refused to sign the SCC, explaining that he often made jokes that could be perceived as offensive and felt that agreeing to the document would therefore be dishonest. Rather than exclude the student, the educators engaged in personal dialogue. Together, they agreed that the student could his maintain personal views privately, but must adhere to the SCC while in the lab. This showed that shared responsibility in a diverse learning environment often requires negotiation and reflection, not just rule enforcement.

The Tellegen Hall SSC has set a precedent within the wider Faculty of Electrical Engineering, Mathematics and Computer Science. Following its implementation, every research section and the Department of Microelectronics as a whole developed their own context-specific Codes of Conduct. These local versions build on TU Delft's university-wide

Code of Conduct, translating its principles into concrete expectations for individual labs and research groups. This expansion demonstrates how the SCC acted as a catalyst for cultivating responsible and inclusive academic environments at multiple levels of the institution.

Insights

This case demonstrates that student responsibility can be cultivated through co-created norms and practices. Rather than imposing rules from above, this approach invites students to reflect on their values, provide input, and take ownership of the social dimensions of their learning environment. When students participate in writing the rules, they are more likely to respect and uphold them. The Tellegen Hall SCC and the mentorship exercises associated with it also illustrate that in physical learning environments where students spend long periods of time together and must collaborate intensively, co-created norms are not only beneficial but essential.

Testimonial (student)

“Before, [the SCC] was just a lot of text. Now, it actually makes sense: you understand what is expected, and why.”

4. Co-creation of the Advanced Training Program for TAs



Case owner:

Margreet Docter

Faculty:

Applied Sciences

Dimensions:

Meta-cognition, learning strategies

Context and motivation

Within the Nanobiology BSc program at TU Delft's Faculty of Applied Sciences, Teaching Assistants (TAs) play a pivotal role. They are often the main point of contact for students and serve as frontline guides in labs, workgroups, and tutorials. Yet for many, they are given a teaching role with little preparation or pedagogical support.

To address this gap, Margreet Docter developed a new initiative to professionalize TA development through offering co-created training workshops, peer learning through intervision, and observations by teachers. In this initiative, rather than positioning TAs as recipients of top-down instruction, TAs are active participators, and sometimes even contributors who develop and teach workshops.

The project originated in the educator's own experience, further shaped during a SUTQ and inspired by the Dutch platform *StuKO*, which aims to develop students' teaching abilities, as well as the *Student as Teacher* project at the University of Groningen. The core intention of the project in the Nanobiology department was to support TAs in taking responsibility for how they guide others and to understand what effective education looks and feels like. To further deepen this understanding, Margreet initiated a 15-ECTS Master module Student Teachers in Engineering

Education, to be launched in 2026, which is being developed and taught by experts at Science & Engineering Education, and aims at deepening understanding of effective learning in higher education.

Practice in action

The training program consists of three core elements:

- Workshops co-designed and co-delivered with experienced TAs.
- Intervision lunches where stories and strategies are shared informally.
- Observations with feedback, aimed at sharpening practice through expert and peer input.

TAs involved in the design process contribute directly to the pace, delivery, and content of the workshops. After a brainstorm with the TAs, together with the educationalist, Margreet derives the learning goals, and then hands these back to the TAs to come up with learning activities that align with both the needs of first-time TAs and the broader goals of the Nanobiology curriculum (focusing on the professional skills collaboration, critical thinking and communication). The training program goals include:

- Creating a safe learning environment
- Supporting student motivation
- Asking effective, open-ended questions
- Providing constructive feedback and ensuring fair assessment

One of the most engaging methods used is role play, where real-life classroom situations are simulated and collectively unpacked. Participants take turns enacting and observing, helping each other identify what works and what does not. This method encourages empathy, perspective-taking, and reflective dialogue.

Workshop materials, including an instructor manual, are shared via Brightspace, making them reusable and adaptable. While currently focused on Nanobiology, the intention is to expand the model across the faculty, and maybe even further. The flexible, modular format means it can evolve with future cohorts and changing needs.

The learning experience is highly participatory. Activities are varied and designed to be immediately applicable. Whether a TA is facing a silent group, a confused student, or an unexpected dilemma, the training offers tools to respond with confidence and care. As co-creators, TAs also gain a stronger sense of agency and professional identity. They not only just learn how to support, but learn how to lead. A great skill to acquire, especially for students interested in the Master elective *Student Teachers in Engineering Education*.

Reflections and results

During the workshops, TAs were observed to open up quickly, sharing experiences, offering feedback, and reflecting on classroom challenges with honesty and enthusiasm. The role plays were particularly effective in surfacing real concerns and practical strategies. Many participants left with a richer sense of their own teaching identity, and a deeper appreciation of the TA role.

One surprising moment came when the workshop hosts themselves were challenged by the insights of their peers. This demonstrated the reciprocal nature of teaching and learning, and affirmed the belief that "you learn most by teaching" - a nod to the Feynman Technique, which was indirectly embodied in the process.

TAs reported learning from each other's style and perspective. As one shared: *"seeing other TAs in action helped me learn more about what I should and should not do as a TA."* Another noted: *"it made me ask questions I had never asked before."*

The main implementation challenge was time. With enthusiastic engagement and rich discussions, sessions often risked running over. Still, the energy and ownership displayed by participants affirmed the value of creating this shared space for reflection and practice.

Insights

This case shows that when TAs are trusted as educational partners, they rise to the occasion. Through co-creation, practice-based reflection, and peer learning, they learn about teaching skills, and some even grasp the

opportunity to develop the mindset of being a responsible educator. In professionalizing TAs through co-creation, we empower not only the TAs themselves, but also the students they support, creating a ripple effect of responsible teaching and learning.

Testimonial (by TA)

"During the workshop, the responses from participants made us revisit our own assumptions. It showed me how much you learn when you teach."

5. Students choosing their own learning journey



Case owner:

Nikolina Šoštarić

Faculty:

Applied Sciences

Dimensions:

Motivation, meta-cognition

Context and motivation

The first-year bachelor's course Programming Foundations (NB1420), part of the Nanobiology program at TU Delft, introduces students to Python programming and fundamental digital tools such as Git and the command line. Students enter this course with varying levels of prior experience: some have never programmed before, while others have substantial knowledge.

Nikolina Šoštarić, the course coordinator, saw this diversity as a chance to give students ownership and autonomy over their participation. Instead of delivering only one instruction, the course offered two distinct assessment trajectories, encouraging students to reflect on their own learning needs and make an informed commitment. The model, inspired by Bionanoscience colleague Jos Zwanikken's approach, aimed to make students agents in their own development, choosing a structure that matches their background and the time they wish to invest.

Practice in action

At the start of the course, students chose between two assessment trajectories. The choice had to be made in the first week and could not be changed later. A pre-test was offered to help students reflect on their experience and make an informed decision.

Trajectory I, called the Training Schedule, was designed for students without prior programming experience, or those lacking confidence.

It included regular in-class quizzes, formative peer feedback, and three graded assignments. These quizzes served as pacing tools and checkpoints for understanding. Peer feedback moments were mandatory but ungraded, designed to support reflective practice and peer learning.

Assignments formed the backbone of the assessment. Each of the three graded assignments was worth 30 percent of the final grade. A minimum grade of 5 on all three was required to pass. Of the assignments, the best five out of seven counted, which let students try to do their best each time. To reach a top grade, high quiz scores could contribute an additional 10 percent. Students who choose not to participate in quizzes can still score a maximum grade of 9, ensuring fairness and clarity in the grading model.

Trajectory II, titled Experienced Programmer, was intended for students already familiar with the course content. In this track, assessment was based entirely on the same three graded assignments, each weighing 33.3 percent. Students in this track were free to attend or skip class activities like quizzes and peer feedback. This path offered autonomy and a reduced workload for students already competent in Python programming and foundational computing skills.

The learning environment was designed to be inclusive of both tracks. Exercises in the online interactive book were offered on three levels (beginner, intermediate, expert). All students had access to the same course materials and activities, but were trusted to engage in ways that matched their personal learning goals. Students choosing Trajectory I benefitted from a guided learning path, while those in Trajectory II could self-direct their participation.

The structure emphasized formative learning opportunities, transparent expectations, and clear time management. It allowed students to personalize their level of engagement, while still being held to high standards of accountability.

Reflections and results

Because the course has only run once so far, long-term comparisons are not yet available. Still, early observations were promising. Students appreciated the opportunity to self-assess and select a learning model aligned with their needs. Beginners were given space to build skills gradually, while experienced programmers could move efficiently through content without redundancy.

An unanticipated insight from grade analysis showed that for 17% of students in Trajectory I, quiz participation slightly lowered their final grade, despite excellent assignment performance. However, for the majority of students, quizzes had either no effect (34%) or positive effect (48%) on their final grade. This prompted reflection on the impact of quizzes as potential “grade-boosters”. Since the average absolute effect was minimal (only 0.1 points), it was decided to maintain the original structure.

The experience also showed how freedom, when structured well, could support students in taking responsibility for their study planning and academic identity. The differentiated assessment strategy encouraged reflection, supported confidence-building for novices, and respected the time of more experienced learners. Appreciation from the students led to Nikolina being chosen teacher of the year in the department of Nanobiology and the Faculty of Applied Sciences.

Insights

This case demonstrates how flexibility in assessment can foster student agency without compromising academic rigor. When learners are empowered to choose their own path, they tend to be accountable, more reflective, and often more engaged. Carefully designed choice does not mean lowering expectations, but rather recognizing that students learn best when they feel ownership over the process.

Testimonial (by educator)

“The aim is to have students feel more engaged: to support them while they learn at their own pace, and have this behavior feel like something they chose for”.

6. Students as partners in co-creating education

Case owner:

SPiCE

Interview with Hanne Bosma and Viktoria Proffen

Faculty:

Multidisciplinary (all faculties at TU Delft)

Dimensions:

Co-creation, social relation

Context & Motivation

SPiCE is a student-led initiative at TU Delft organised by the TU Delft Teaching Academy. In SPiCE, students from all faculties collaborate on projects that impact TU Delft education. From belonging and lecture attendance to AI in education and the high school-university transition, SPiCE operates with high levels of autonomy to address both student-driven and institutional questions.

The initiative emerged from the observation that although many educational innovations aim to benefit students, their voices often remain underrepresented. SPiCE bridges this gap by offering a structured yet self-directed environment where students act as partners, not just participants. Project leads Hanne and Viktoria report the importance of combining student creativity with genuine ownership, enabling a type of contribution that goes beyond making suggestions and towards lasting impact.

Practice in Action

The SPiCE teams consists of 12 students working across interdisciplinary themes. SPiCE proposes their own projects and/or takes on assignments from educators and university leadership. They design their own way of working, methods, timelines, and deliverables.

The outcome of each project is different: ranging from artefacts such as whitepapers and surveys, to live feedback sessions and reports as input for policy.

SPiCE projects usually unfold iteratively and organically. For example, an early SPiCE assignment on AI in education lacked a clear project owner, requiring the team to define its own goals, audience, and outcomes. Thisstarted with confusion, but ended up becoming a valuable learning experience for the students. The project ended up resulting in whitepaper that sparked conversations with policymakers and teachers, and even led to follow-up collaborations.

What makes SPiCE unique is its grassroots, peer-driven character. Students collect insights via informal means: talking to peers over coffee, at student bars, or with playful meme-driven surveys. Their approach is deliberately non-traditional but yields data that is inaccessible through formal channels. The initiative also functions as a learning-by-doing environment. Students manage stakeholders, facilitate creative sessions, conduct research, and support each other in developing skills beyond the curriculum.

Importantly, SPiCE is supported, not steered, by Teaching Academy staff. This trust-based scaffolding provides a safe space to experiment, fail, and grow. Students co-create not only the outcomes of their projects, but also the process itself.

Reflections & Results

SPiCE empowers students to position themselves as active shapers of education. Members report skill transfer to their thesis work, internships, and group projects. They learn to manage diverse teams, initiate creative dialogues, and organize stakeholder collaboration. One member noted, “It feels like we are genuinely trusted; not just to execute tasks, but to shape the work itself.”

While the freedom and complexity of SPiCE projects can be overwhelming, the support from peers and staff creates an environment

where students learn to take initiative and responsibility at their own pace. The initiative proves especially valuable for intrinsically motivated students who want to do more than “just study.”

Insights

This case shows that when students self-organize as partners in co-creating education, they can challenge assumptions, innovate with impact, and learn transferable skills through real ownership. The success of SPiCE rests not on control or assessment, but on trust, support, and shared responsibility. It works best not because it is mandatory, but because it is meaningful.

Testimonial (by SPiCE Project lead)

“Because we were trusted to take our own approach, we ended up with insights and outcomes that educators could not have reached on their own – and we learned so much in the process.”

Appendix B.

Overview of activities

17 September 2024

Kick-off session

Led by 100 Days of… Students Taking Responsibility program team

In the kick-off session, educators, students, and support staff explored what "taking responsibility" means in practice. Through dialogue and exchange, participants discussed how taking responsibility is closely connected to the constructs empowerment, motivation, and self-regulation. A key insight emerged from the ideas of students: responsibility cannot simply be given – it must be enabled through trust and thoughtful design of the learning environment.

Four considerations to take away from this session

- Consider how we might design environments that not only encourage **students** to take responsibility, but also invite them to do so by actively building trust, clarity, and psychological safety.
- Consider how **educators** might balance support with challenge, offering just enough scaffolding to promote self-regulation while allowing students space to take initiative.
- Consider how **support staff** might co-create support structures with educators and students that align with a shared vision of responsible learning, thus ensuring accessibility and empowerment.
- Consider how **leadership** can reinforce responsibility as a cultural norm by embedding it in institutional values and aligning policy and infrastructure to foster trust, autonomy, and long-term growth.

1 October 2024

Journal club on "*Does student agency benefit student learning?*"

This session, led by Elli Papageorgiou and Shirong Zhang, explored a systematic review on student agency in higher education. The discussion focused on how agency, defined as the learner's goals, skills, and processes, relates to student responsibility. While agency holds promise for improving learning outcomes, its complexity and the lack of consistent research findings remain challenges.

Four considerations to take away from this session

- Consider how **students** might be supported in developing agency by being offered opportunities to reflect, question, and shape their learning paths – leading to stronger ownership and intrinsic motivation.
- Consider how agency can be made actionable in day-to-day teaching by **educators** through combining interpersonal trust with practical scaffolding, thus helping students navigate choices meaningfully.
- Consider how **support services** might be optimized to reinforce agency – not just by offering resources, but by aligning services with students' decision-making and reflective practices.
- Consider how **leaders** might champion agency not just through rhetoric but by backing research-based strategies and facilitating time and training for educators, so that they can make agency part of everyday practice.

22 October 2024

Meet & eat (lunch lecture) on "*Teaching assistants taking responsibility*"

This lunch lecture, led by Margreet Docter, explored the role of Teaching Assistants (TAs) in enhancing student learning and easing educator workload. TAs can act as a bridge between students and

staff, contributing to engagement, trust, and motivation. A 15-ECTS Educational Leadership Program was introduced to equip TAs with skills to take meaningful responsibility in educational settings.

Four considerations to take away from this session

- Consider how **students** might benefit from empowered TAs who model responsibility and act as approachable role models, helping build confidence and encourage ownership among peers.
- Consider how involving trained TAs might enable **educators** to both extend their pedagogical reach and focus on deepening educational quality, while also fostering peer-led learning cultures.
- Consider how **support staff** teams might invest in frameworks and coordination that integrate TAs meaningfully, maximizing their contribution and ensuring continuity across teaching teams.
- Consider how **leadership** might view TA development as a strategic tool for meeting rising demands – embedding resilience and accountability through role development and institutional investment.

26 November 2024

Journal club on *"An expectancy-value-cost approach on taking responsibility"*

This session, led by Erdem Onan, focused on the Expectancy-Value-Cost (EVC) model as a lens to understand student motivation. Special attention was given to "cost" as a hidden barrier to learning, shaped by time, effort, and perceived value. Participants reflected on how to design education that supports autonomy while addressing these challenges through guidance, relevance, and support.

Four considerations to take away from this session

- Consider how **students** might be guided to better understand what drives or hinders their motivation, identifying hidden "costs" and finding personal strategies for staying engaged and self-directed.

- Consider how **educators** might use the EVC model to address motivational gaps by making value visible, costs navigable, and expectations manageable, without reducing academic challenge.
- Consider how **support staff** might use the EVC lens to streamline processes and reduce complexity - easing innovation and creating space for educators to focus on what matters most to students.
- Consider how **leadership** might implement institutional policies that align with the EVC model to sustain engagement through professional development, student coaching structures, and alignment between curriculum and learner needs.

28 November 2024

Case-pitching session on "*Connecting - and sharing examples of educators working on Students Taking Responsibility"*

Led by 100 Days of… Students Taking Responsibility program team

This session brought together a diverse group to exchange concrete examples of fostering student responsibility. Key themes included co-creating learning objectives, integrating choice into team work, and balancing structure with autonomy. Educators were encouraged to create trust without over-directing, in order to empower students through active participation.

Four considerations to take away from this session

- Consider how we might empower **students** to co-design elements of their learning – whether through objectives, feedback, or planning – in order to deepen ownership and relevance.
- Consider how we might enable **educators** to cultivate responsibility not just by clarifying expectations but by co-creating them with students, without overpreparing or constraining their agency.
- Consider how **support staff** might alleviate operational burden so educators can invest time and energy into student ownership, thus contributing to a more sustainable and engaged teaching culture.

– Consider how **leaders** might create institutional frameworks that make flexibility and co-creation possible, allowing student agency to thrive within guided and structured pathways.

10 December 2024

Education conversation on "*Taking responsibility – Perspectives on motivation, structure, and culture*"

Led by 100 Days of… Students Taking Responsibility program team

This reflective session explored how motivation, structure, and cultural context shape responsibility in education. Participants emphasized the need for guided autonomy, a progressive shift from structure to freedom, and sensitivity to diverse student backgrounds. Inclusivity, coaching, and intercultural collaboration were recurring themes.

Four considerations to take away from this session

– Consider how **students** might navigate their journey through structured autonomy – seeking help when needed, yet daring to step into uncertainty as they grow into responsible learners.

– Consider how **educators** might tune the balance of structure and freedom for each learner, calibrating the "sweet spot" of support where autonomy is nurtured, not assumed.

– Consider how **support staff** might reduce complexity and increase clarity, by providing structures that enable educators and students alike to focus on meaningful engagement.

– Consider how **leaders** might foster a culture of motivation and inclusivity by integrating flexibility, safety, and intercultural understanding into curricular and policy design.

Research activities

The dimensions presented in this book were developed as part of a Q-methodology study aimed at identifying distinct teacher viewpoints regarding how students may take responsibility for their learning. In

addition, individual interviews with teachers were conducted to further explore the factors teachers perceived as facilitating or hindering students in taking responsibility for their learning.

The initial development of these dimensions was informed by a review of the literature on student responsibility for learning and related constructs such as self-regulated learning, student agency, and student autonomy. The initial terms associated with these dimensions were discussed and revised in collaboration with teachers at TU Delft, refined through feedback from students, and subsequently reviewed by two experts in engineering education.

Dimensions and ways of taking responsibility for learning

Course participation and learning activities

- Engaging critically with ideas presented in the course
- Coming well prepared to participate in course activities
- Making contributions during class that promote discussion and learning
- Reviewing course materials when needed to support ongoing learning
- Using effective study strategies that promote deep understanding and knowledge transfer
- Seeking out additional resources beyond the required course material
- Seeing teachers as one possible source of knowledge, not the sole source
- Managing their time effectively by setting priorities

Motivation

- Showing a desire to learn even when other commitments compete for attention

- Continuing to show interest in learning even when tasks are difficult or feel boring
- Seeing themselves as the main source of their own academic success or setbacks
- Persisting when faced with academic challenges
- Engaging in coursework with the goal of mastering the subject, rather than simply completing tasks or aiming for high grades
- Considering the ethical consequences of how they use the knowledge and skills gained in their education
- Seeing academic setbacks or failures as an opportunity for learning and growth

Metacognition and learning strategies

- Setting learning goals to guide study activities
- Changing learning strategies when current approaches are not effective
- Assessing their own thinking to identify potential gaps and errors
- Matching learning strategies to the requirement of specific tasks
- Reflecting on their development as future professionals
- Keeping track of deadlines and progress

Making connections (within, across, and beyond disciplines)

- Connecting concepts learned in previous courses to the current course and beyond
- Applying knowledge beyond the classroom
- Integrating knowledge and methods from multiple academic fields
- Learning about topics outside of their immediate discipline
- Recognizing the societal, technological, and environmental impact of their future professional role
- Generating multiple solutions to a problem by exploring alternative viewpoints

Students as co-creators of learning and teaching

- Recognizing themselves, peers, and teachers as part of a learning community
- Offering insights and feedback to teachers about classroom practices
- Considering themselves as an important stakeholders in shaping classroom practice
- Taking initiative in co-designing classroom activities
- Communicating with teachers when expectations or workloads feel unmanageable
- Contributing to decisions about course structure and workload

Emotion regulation, empathy, and social relations

- Contributing to a safe learning environment
- Recognizing how their words or actions affect others
- Changing their behavior when it negatively affects others
- Collaborating effectively during group work
- Ensuring fair distribution of work when working in a team
- Managing emotional responses in socially challenging situations, such as disagreement or receiving feedback
- Supporting the learning of peers when they face difficulties

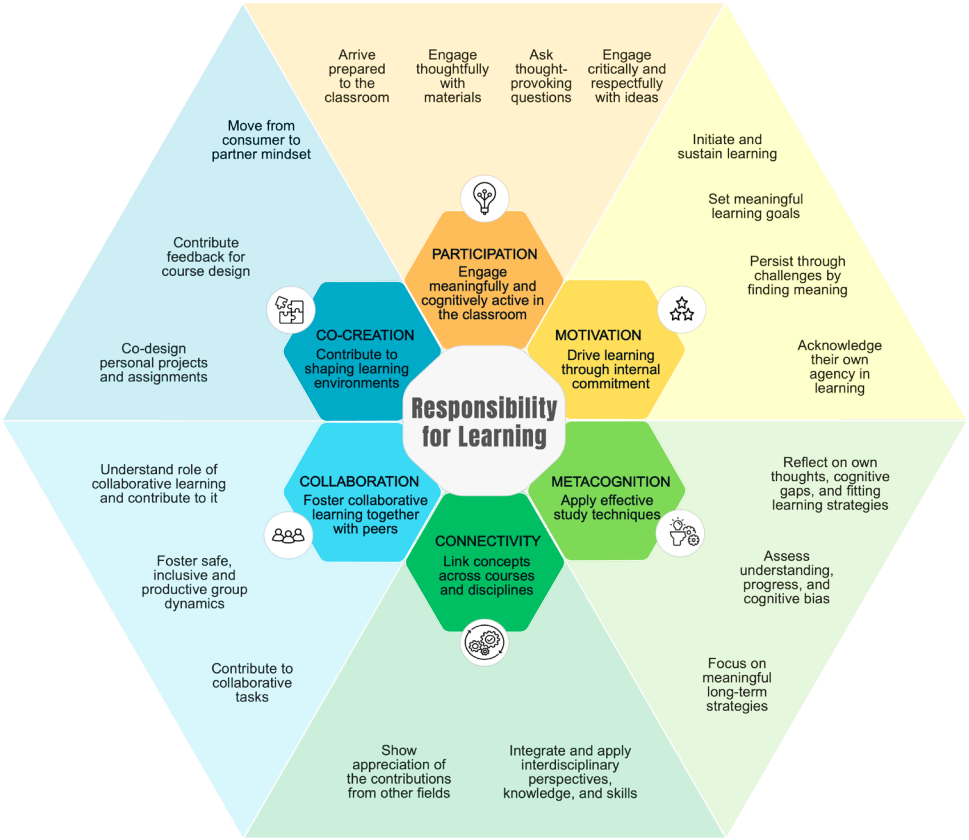


Image 10. Responsibility for learning (illustration), 2026, by Tanja Richter. Reprinted with permission.

Helping students to develop a sense of responsibility for their learning is widely recognized as a key goal of higher education. OECD identifies ‘taking responsibility’ as one of the three critical transformative competencies that every student should develop to navigate the unpredictable societal, economic, and environmental challenges of the future. Yet, taking responsibility, particularly in the context of learning, is a complex construct as it carries multiple meanings, interpretations, and implications.

TU Delft’s IDEE (Innovation in Delft Engineering Education) Initiative aims to address these complexities within the Students Taking Responsibility for Their Own Learning Process theme. This book, which is one of the early outputs of this initiative, presents our initial findings and lays the foundation for future research.