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HEALTHY CHALLENGING DESIGN EDUCATION FOR ENGINEERS

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ABSTRACT

Teaching design skills to engineering students has long been one of the main building blocks of the bachelor curriculums at the TU Delft faculties of Industrial Design Engineering and Architecture & the Built Environment. We observe that our students achieve high-level (design) competencies during their study time at TU Delft. But we also observe that design education goes together too often with over-aroused students and ambitious teachers, leading too often to higher levels of student stress. With the support of the Dutch 4TU Centre for Engineering Education, we asked first-year bachelor IDE and ABE design students about their perceived levels of arousal and the factors within the design education learning environment, which contribute to a positive or negative study experience. This paper will show our understanding of our design education pedagogies, our model of spheres of influence, and potential coping strategies for students and tutors. We indicate five spheres of influence for our design students: the student self, design tutors, classmates, the learning environment, and society at large. Each sphere consists of various potentially stressful factors. The coping strategies we propose focus on helping students to find ways to become aware of their feelings and thoughts, the meaning they give to them, and the kinds of behaviors and (short-term and long-term) consequences which follow from there. We also emphasize the role of the community of teachers and students to help individual students assess those (potentially) stressful situations constructively.

KEYWORDS

design education, self-leadership, workload, health, coping strategies, Standards: 8, 9

INTRODUCTION

Teaching (physical) design skills in small studio groups of 10-25 engineering students has long been one of the main building blocks of the engineering curriculums at the TU Delft, in particular in the fields (and faculties) of Industrial Design Engineering (IDE) and Architecture & the Built Environment (ABE). The small group teaching approach in design education brings many advantages, such as community building between students (and mentors), student commitment, student engagement, and student visibility. The design studio is a stimulating and activating learning environment (Lawson & Dorst, 2009; Ghassan & Bohemia, 2015; Van Dooren, 2020) (Figure 1). It is the physical place where students get together many hours during the week to work on their individual and/or group assignments and projects. It is also the physical place where the students meet their tutors[1] for discussion, feedback, review, and assessment.

Figure 1. Typical TU Delft IDE/ABE design studio situation for undergraduate students

We observe that our IDE and ABE students achieve high-level (design) competencies during their study time at TU Delft. But we also observe that design education goes together too often with over-aroused students and (over-)ambitious teachers, leading to higher levels of student anxiety and stress. This results in the threat of underperforming students, increased levels of student dropouts, and increased levels of student burnouts.

So, despite the positive nature of the studio learning environment, we see that our design education also brings many challenges with student well-being. At TU Delft we fully share the positive and negative experiences expressed above. We know from all kinds of research and faculty education evaluations from within and outside the faculties - such as the Dutch national student survey, our faculties' Quality Assurance Agencies, our study associations, our study counsellors - that the workload for IDE and ABE students is (perceived as) very high and that study stress is almost a given fact. In 2019, the VSSD – a TU Delft-wide student organization – did research on the perceived levels of stress among Delft engineering students (VSSD, 2019). It was shown that engineering students from all eight TU Delft faculties experience relatively high stress levels, but students from the IDE and ABE faculties together make the top 2. Both faculties feel the need to improve significantly here and to work towards a more healthy, but still challenging learning environment for their students.

[1] In this paper we will use 'tutor' to indicate the person who helps, teaches, and coaches the design student(s). Other words which we could have used are: teacher, coach, mentor, supervisor.

This paper aims to present on the one hand the conditions that (could) make design education stressful, and on the other hand how students and teachers can cope with these conditions in a constructive, positive way. With the support of the Dutch 4TU Centre for Engineering Education, we asked hundreds of first-year bachelor IDE and ABE design students (in the period of 2020-2021) about their perceived levels of arousal and the factors within the design education learning environment, which contribute to a positive or negative study experience. Questions and evaluation criteria were based on and derived from literature reviews focused on perceived stress scales, self-determination theory, and study success and student health. These questions were integrated into the regular course evaluations run by the Quality Assurance departments of the IDE and ABE faculties. Some questionnaires were followed up by a panel talk with a limited number of students to get a better understanding on the given answers.

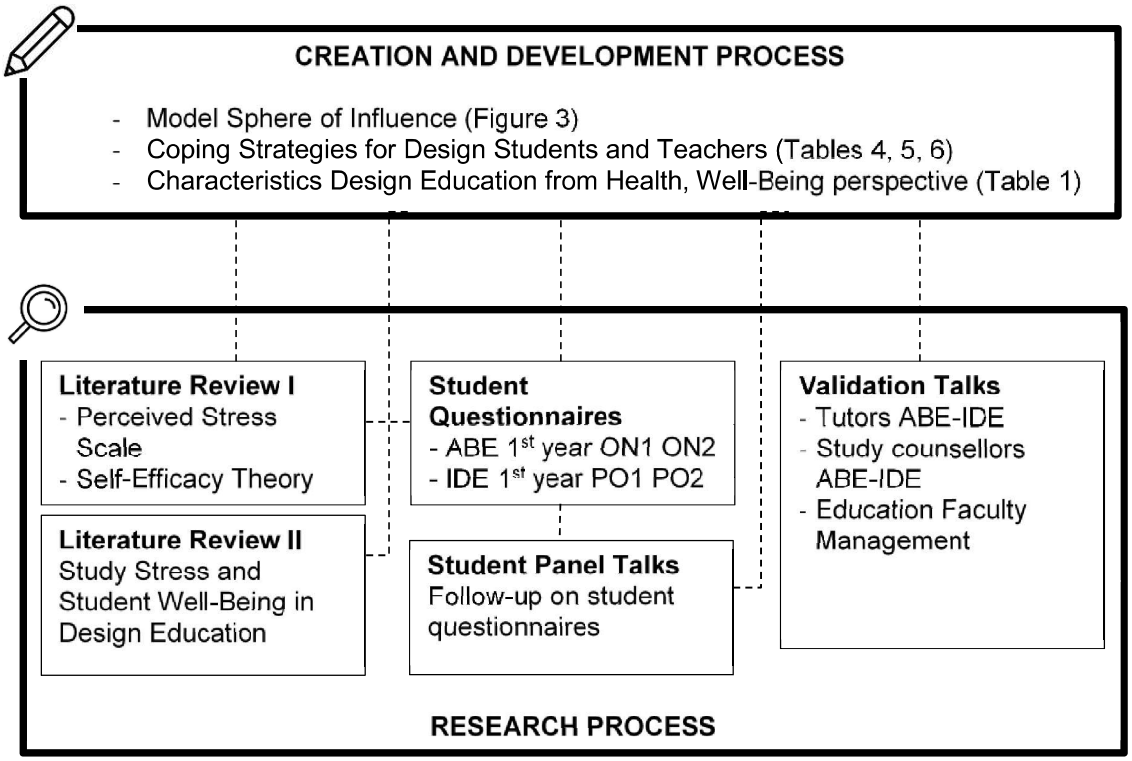

Figure 2. 4TU.CEE Healthy Challenging Design Education Project Approach

Supported by the quantitative and qualitative data we developed a model named 'Spheres of influence' and an approach towards potential coping strategies for students and design tutors. This process of 'creation' (see Figure 2) we did together not only with three first-year design project coordinators from both faculties but also with an external consultant who specializes in secure-based leadership approaches and three Quality Assurance staff members from both faculties. As a validation step, the synthesis of these results was discussed with faculty student counsellors, three mixed panels of design tutors from both faculties, and faculty education management.

Since early 2020 the COVID-19 pandemic has put additional pedagogical, health, and well-being challenges to higher education; for students, staff, and management. It also impacted

our Healthy Challenging Design Education project that was initiated long before winter 2020. For design education, the 100% online and hybrid learning environments have also been unknown territory for the large majority of students and staff to learn and teach design. How this journey of online design education will go in campus universities, is still to be seen. First research results have become available on the impact of the pandemic on engineering education in general (e.g. Lomans et al., 2021).

STUDY SUCCESS AND STUDENT HEALTH IN TODAY'S HIGHER EDUCATION

Study success, health, and well-being of students are not only discussed intensively in universities worldwide but also in society at large. There are many, yet quite 'normal' and 'logic' stressors for students, such as financial insecurity, dealing with a new situation in life (new study program, new institute, new home, new city, new friends, etc), binding study advice policies from universities, dealing with (exam) deadlines, and the high expectations which many students have themselves, or from their parents or family. Most of these are elements which automatically go with higher education. And we cannot avoid, and perhaps even do not want to avoid these, as they are part of the academic journey and maturing.

Let's be clear: some level of stress is good and healthy for people, and makes people perform better. And of course, different people respond differently to stressful environments or stressful moments. But in general, it is destructive for people to have too high stress levels, or high stress levels for a too long period, or to have too little recovery time. For the (partly) 'unavoidable' stressors, it might be most smart to help young adults to develop personal leadership skills to better manage uncertainty, dynamics, and complexity in one's (new) life as a student in an effective way. For the 'avoidable' stressors, such as poor organization of education, or too many conflicting deadlines, there is a large responsibility for teachers and education management.

Although study stress in higher education has been researched in several disciplinary contexts, or for specific universities, or in more general terms to better understand the notions of health and wellbeing in (higher) education (e.g. Centre for Education Statistics and Evaluation, 2015; VSNU, 2020), study stress and student wellbeing have not been researched in-depth in design education specifically. Two pieces of research in the field of architecture and the built environment pop up.

The results of the Architect's Journal 2016 annual student survey in Great Britain clearly show student fears over - in particular - financial debt and workload. 'Just over a quarter of students surveyed (26%) said they were receiving or had received medical help for mental health problems…' 'Just over nine in ten (91%) students reported working through the night for their studies at some point - and almost one in three (29%) said they did it on a regular basis' (Waite and Braidwood, 2016). In the Netherlands, Tilman (2016), the editor in chief of the Architect magazine, reflects in his blog on this study. He calls the field of architecture 'a profession that never sleeps' and he presents the mirror that this culture is present in both education and practice, with all its negative consequences for the health and wellbeing of both students and practitioners.

In 2013 the Graduate Architecture, Landscape and Design Student Union (GALDSU, 2013) at the University of Toronto published the results of its first mental health survey. The report shows a worrisome picture of the unhealthy and stressful design student experience: gigantic workload, unhealthy lifestyles (skipping meals, irregular sleep schedules, rarely exercising),

faculty disorganization, stressful days and weeks before the crits, unhealthy working environment in the studios (noise, air quality, lighting etc), and the faculty's administration not doing enough to address these issues. On the ArchDaily website, Whelan (2014) gives a to-the-point perspective on those GALDSU findings. '… to keep up with the stressful and demanding workload, survey respondents confessed to having developed many bad habits…' '…Bad habits are formed when a specific behavior results in a favorable outcome, leading to the conditioned repetition of these actions.'

DELFT DESIGN EDUCATION

In our two monthly project team meetings, as well as in our validation interviews with the student counselors, design tutors, and faculty education management, we discussed the features and characteristics of our TU Delft IDE and ABE design education and learning environment, in particular from a student experience, study success, and well-being point of view. We came to a set of more positive and more critical characteristics (Table 1) focusing on the themes of 'community', 'assignment', 'pedagogy', 'design process', 'assessment', and 'ambition'.

Table 1. Characteristics TU Delft IDE and ABE design education from a student experience, study success, and well-being point of view

Positive side	**Characteristic**	**Negative side**
Many small groups increase the visibility of individual students. Students meet a variety of helpful tutors during their studies. The involvement and commitment of both students and tutors are high.	Community	The large diversity of students and tutors working closely together and interacting intensively makes the learning environment more vulnerable to social safety issues. Sometimes there is competition between students (awards, prizes, student contests).
Studio activities are both synthetic *and* analytical, and both creative *and* reflective. Assignments are hands-on, pragmatic, applied, derived from practice, and oriented towards solving (a) concrete problem(s).	Design assignment	Design assignments are (on purpose!) complex, open-ended, ill-defined resulting in an endless solution space. The workload is high.
There is an activating and challenging studio 'vibe': curiosity, exploration, idea development, lateral thinking, and working with alternatives are stimulated. Sharing ideas among students is stimulated.	Studio pedagogy	Feedback and crits are very often 'in the open'. Students can feel 'attacked'. Oral presentations, expert and peer reviews, mid-term assessments, deadlines, milestones, deliverables: there are many obstacles and/or hurdles to take for students.
Students get a lot of freedom and responsibility to develop their process, style, and design language.	Design process	It can be not clear for (undergraduate) students what a (good) design process should look like, and when a design process is done or finished satisfactorily.
The final design product is something that the student makes: concrete, tangible, visible.	Assessment	The level of performance can be unclear to students; it might be not clear if the learning, the learning or design process, or the design product is assessed (or all?). Assessment may sometimes feel more subjective.
Programs teach value-centered design approaches to improve the world (more	Ambition	Students are quite often highly talented, ambitious, and self-critical perfectionists; and

sustainable, juster, more healthy, more inclusive, more resilient, etc). A designer is seen in Delft as a team player.		uncertain as they do this for the 'first' time. Tutors might see the potential of a very interesting design idea/concept, and stimulate/push the student to work even harder. Design is never finished.

INDICATION OF STRESS LEVELS

To get an indication of the perceived stress levels among the students of IDE and ABE in the design projects, we used the regular faculty evaluation moments to ask a few additional well-being questions. In the project team, we intensively discussed which kinds of questions and which kind of tone of voice would be best to use in the student questionnaires. We wanted to avoid notions such as 'stress', 'health', 'well-being', and 'burnout' as they might bring students in a less neutral mood. In the end, we developed six questions using the perspective of 'study experience' (Appendix 1). We included in our first question four sub-questions from the Perceived Stress Scale (Cohen, Kamarck & Mermelstein, 1983), the most widely used psychological test for measuring the perception of stress. This scale has been validated in different contexts and is therefore both reliable and valid. Here, stress is defined as high perceived helplessness and low perceived self-efficacy. To limit the length of the total questionnaire, we used the four item-scale (PSS-4). Additionally, the other five study experience questions are closely connected to the self-determination way of thinking (Ryan & Deci, 2000; Linnenbrink, Patall, & Pekrun, 2016) which focuses on competence development, autonomy, and relatedness from a more positive and a more negative point of view.

In this paper we present a small part of the results of the online questionnaires which were sent to our first-year students in the academic year 2020-2021. Both faculties have a numerus fixus (IDE 350 students, ABE 400 students), which means that the total amounts of students in the first first-year projects are around these numbers. During the year a small number of students drop out (eg wrong study choice), so the total amounts of students in the second first-year projects are a bit lower. For our study we had 456 valid entrees.

Table 2 shows the PSS-4 results per studio from the 2020-2021 surveys in the IDE and ABE faculties. From reference research (Vallejo et al., 2018; Lesage et al., 2012) we know that an average score around 5 is 'healthy stressful' and from 6 on it becomes more (and more) unhealthy. The average score for the four studios is 6.1, but about half of all participants scores 6 or higher. For the IDE1, IDE2, and ABE1 cohorts, we can conclude that the average score is 'healthy positive', although a large number of individuals scores go beyond 6. The ABE2 studio has a significantly higher and more worrisome average PSS-4 score of 8.3. This confirms earlier course evaluations by the ABE faculty's Quality Assurance department where students shared their concerns on (among others) the workload of this studio.

Table 2. PSS-4 scores first-year TU Delft design studios Industrial Design Engineering (IDE1 and IDE2) and Architecture and the Built Environment (ABE1 and ABE2)

Project	Period	Number of participants (n=456)	Average score	Standard deviation	% with score >= 6
IDE1	Autumn '20	101	5.4	2.5	41%
IDE2	Spring '21	126	5.5	2.9	47%
ABE1	Autumn '20	159	5.2	3.3	43%
ABE2	Spring '21	70	8.3	3.4	76%

SPHERES OF INFLUENCE

The open remarks in the questionnaires and the follow-up panel talks gave us the input for our model 'Spheres of influence' (Figure 3 and Table 3) which we developed during our project team meetings in co-creation. Our validation talks with tutors, student counselors, and education management told us that these five spheres were 'recognizable', 'distinctive', and 'usable' to explain the complex nature of the well-being issue in design education. For our model we used the metaphor of a mountain climber, i.e. the student (self (1)), who is secured by a teacher, supervisor, mentor, or coach (design tutor (2)), does not climb alone (classmates (3)), climbs in a challenging, rocky environment (faculty learning environment (4)) and in a wider setting and scenery (societal context (5)). Each sphere consists of various potentially stressful factors or situations (Table 3).

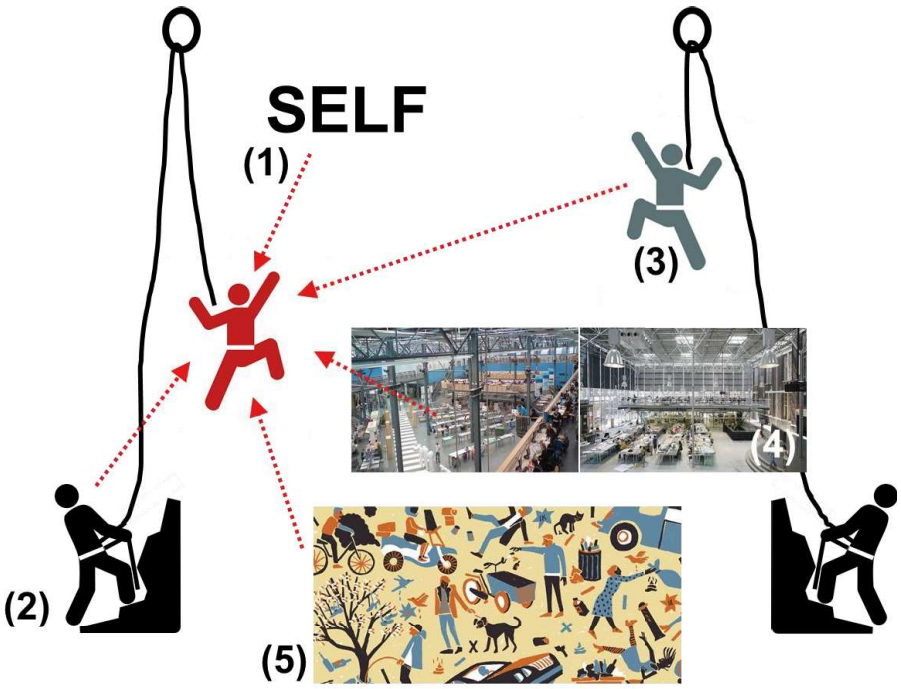

Figure 3. Five Spheres of influence: (1) Self, (2) Tutor, (3) Classmates, (4) Learning Environment, (5) Society

Table 3. Potential stressors within the five Spheres of influence

Sphere	Potential stressors
(1) Self	The degree to which the student him- or herself takes responsibility for • balancing study efforts vs relaxation • having realistic expectations • meeting personal needs • developing self-insight and making choices • maintaining focus and setting standards for him- or herself • reflecting on and learning to deal with external influences • …
(2) Tutor	The way the design tutor • communicates and gives feedback • inspires and motivates • coaches, supports, and steers • organizes supervision, facilitates, and moderates • assesses and uses assessment criteria • …
(3) Classmates	Other students are points of reference for • co-operation, peer-learning, and community building • performance level • working attitude, approach, and opinion development • inspiration and motivation • …
(4) Learning environment	Important, determinative factors • (intended) learning objectives and course contents • assessment strategy and assessment criteria • progress requirements • schedule, deadlines, and deliverables • ateliers, studios, rooms, facilities • sense of community and belonging • …
(5) Society	Various societal factors have various kinds of impacts which students have to deal with • starting at a university means a new life phase, new living conditions, new friends, and new social activities • financial arrangements, such as loans • diploma pressure of society • family and friends with their expectations and hopes • (social) media and the (societal, perceived) image of 'success and failure' • the thought that study is a right instead of a privilege • …

COPING STRATEGIES FOR STUDENTS AND TUTORS

Society, faculty, tutors, and students themselves should try to avoid destructive, unnecessary, unrealistic, and/or unproductive (for learning) stressors in the learning process of students. But an important notion (for all stakeholders involved) is that meeting stressors is not at all bad for students. Students 'just' have to learn to deal with them constructively. Stressors are 'simply' part of life, study, or design education. We put 'just' and 'simply' between hyphenation marks as this is easier said than done. Also in the questionnaire, some potential stressors, e.g. deadlines, were (also) indicated by the students as contributing to a positive experience.

So, we argue that when a certain potentially stressful *event, situation, or observation* happens, it is first and foremost important to understand what kind of *meaning* a student gives to it, and which *feelings* and *thoughts* build that meaning. From that step, students will show certain

more or less constructive behaviors. And those behaviors will have both more short-term, pragmatic kinds of consequences and more long-term, emotional kinds of consequences. From a more positive or negative approach and mindset towards a certain stressful situation, completely different patterns might result in the daily lives of students an in their attitudes. See the following two examples of a student facing an overcrowded, noisy studio space as a stressor and a tutor who gives a bit unclear feedback (Tables 4 and 5).

Table 4. Noisy, overcrowded studio coping example (Main spheres of influence: student – learning environment)

+ **Positive approach and mindset**	**Steps**	**-** **Negative approach and mindset**
A student enters an overcrowded and noisy design studio room.	Event, situation, observation	A student enters an overcrowded and noisy design studio room.
"Wow, what a hive, a huge source of inspiration, creativity, and liveliness. A lot of people to get feedback from and to give feedback to. This gives me energy." Or: "O boy, I need a place to work in silence now, so I will get to this creative hive later today when I have something to show and discuss myself."	Thoughts and feelings: giving meaning	"Whaaa! What a mess here. In this environment I cannot work, let alone learn. This does not work for me. What was I thinking this morning when I had good hopes for working in the studio?"
The student discusses and exchanges thoughts and ideas, and a lot of peer feedback takes place. Or: the students looks for a more quiet place, for now, produces materials, and goes back to the studio later.	Behavior	The student leaves the studio, goes home with good intentions to work there, but with some distractions around, only partly does what (s)he should do.
The student makes a lot of progress and due to the feedback develops a better plan. But the student also learned a lot from the design (processes) of others. Or: student has been able to make progress, and discusses it briefly with other students. Gets (limited) feedback.	Short-term consequences (practical)	Too little progress, some procrastination, a bit tired (mentally in particular) from traveling back and forth to the faculty for nothing. Student missed the opportunity for exchange, bonding, and peer learning.
A positive feeling towards the studio as a learning environment. Students want to come here more often. Or: Student has experienced and learned how to take into account one's own needs, and behave accordingly.	Long-term consequences (emotional)	The student is reluctant to work in the studio, will miss the studio learning experience as it is meant. Student shuts off from others and disentangles from the community.

Table 5. Tutor feedback coping example (Main spheres of influence: student – tutor)

+ **Positive approach and mindset**	**Steps**	- **Negative approach and mindset**
My tutor says I have to do things differently.	Event, situation, observation	My tutor says I have to do things differently.
"I have to learn something which I have not done nor shown yet. And my tutor invites me to explore further, and develop more design alternatives. That is new to me, so that is both interesting and exciting."	Thoughts and feelings: giving meaning	"O boy, my tutor tells me (again, sigh) I did a bad job and that my ideas are misplaced. Perhaps I should stop putting so much energy into it, and just do what I think my tutor wants me to do. I could also quit and do the studio next year when I get a tutor with whom I can easier communicate."
The student starts to explore.	Behavior	The student limits efforts and stops exploring.
The student develops a better-underpinned design proposal and has experienced more perspectives towards the design (process).	Short-term consequences (practical)	Learning slows down, and the creative, explorative, divergent, and lateral thinking stops. Weaker results, perhaps even a fail.
The student's confidence has grown in design (processes). The student has learned to deal with comments and (re)interpret feedback.	Long-term consequences (emotional)	The student's confidence has decreased in design (processes). The student developed a more negative attitude ('see, this is too difficult for me') and has not learned how to deal with feedback.

Important questions which derive from here are about the role of design tutors in all of this. For example, can a tutor stimulate and support students towards (more) constructive behavior (see Table 6)? Usually, design tutors are not trained as psychologists, social workers, or professional coaches. Tenured academic TU Delft staff, both lecturers and professors, should have at least a University Teaching Qualification, but the themes of student-wellbeing and coaching are addressed only to a limited extent in that kind of course. Additionally, many of the TU Delft IDE and ABE design tutors in our undergraduate programs have a position in practice or industry and help us with educating our large number of students; our so-called part-time (e.g. 0.2fte) practice teachers, sometimes with limited formal pedagogical training. We do offer them a series of (short) workshops on design pedagogies. But our validation talks with the design tutors told us that many tutors are open to hearing and learning more about this. One colleague even said: '…and we might also learn a thing or two for balancing our own lives better." And whenever there is a really sensitive well-being issue, tutors should refer a student to a student counselor and/or a general practitioner.

Table 6. Tutor feedback coping example: tutor perspective

Objective of tutor I would like this students to explore more design alternatives, to look for different directions, and to do some more lateral thinking.	
What the tutor says "You have to do things differently."	
Observation by the tutor (+) The student looks positively aroused, surprised, curious. The student asks questions about Why? How? When? The student looks up, continues making eye contact. The student remains open, communicative, and enthusiastic. The student's posture is active and open.	**Observation by the tutor (-)** The student looks shocked. The student stops speaking. The student looks downwards, avoids eye contact. The student is less open, less communicative, less enthusiastic. The student's posture is passive and closed.
Coaching on meaning Offer support, but leave responsibility where it belongs: that is, with the student! Name what you observe (can also later; an hour, a day, a week). Check if you observed correctly. Rephrase original feedback. Be congruent yourself in your language, mimics, posture, thoughts, and feeling. Speak out your confidence when appropriate. Speak out your concerns when appropriate. Encourage the student to make the next steps, because without action there will be no result. Show that exploring and experimenting is the core of design (processes): fall and rise are okay, actually: it is the intention of design (processes) (and design education).	

CONCLUSIONS, RECOMMENDATIONS, DISCUSSION

Better understanding of what is at stake is helpful for all involved: change of culture

The objective of this research project was to understand better the conditions that make design education more or less stressful and find ways how students and teachers can cope with these conditions in a constructive, positive way. Our 'answer' to these challenging ambitions are our Healthy Challenging Design Education models which show that the three pillars – *Spheres of influence* – *Student coping strategies* – *Tutor coaching skills* mutually influence and strengthen each other in a positive or negative process towards a(n) (un)healthy challenging design education *culture*. The positives of the design education characteristics will prevail when students constructively face the challenges within the spheres. But also tutors need to help students in facing those challenges; only then the culture can change for the better. But it could also go the other way around towards a more unhealthy culture, when students, tutors, and faculty staff do not feel empowered nor supported to change things for the better. And as cultures are not made nor changed overnight, all stakeholders involved have a role to play.

How to make next steps?

In our project team meetings and our talks with students, tutors, student counselors, and faculty management we always asked if people had suggestions about concrete and feasible steps to improve things for as many students as possible. Additionally, we addressed the kind of style and *tone of voice* which would be helpful. It became clear to us that a multi-layered, multi-stakeholder approach is needed, addressing all involved in various ways and formats: from a logical (academic) point of view but also an empathetic, relational point of view.

That is why we have started in co-creation to develop an accessible and education practice-oriented booklet for both students and staff. We have asked several students, tutors, coordinators, and student counselors to write anecdotally from their own experiences about situations in and/or observations on design education. Thereafter we analyze these anecdotes from the point of view of our model. By doing so, we aim to create awareness of the audience first ('hey, I know/recognize this situation. I have been there myself.') before giving the reader more handles and levers to cope and more theoretical backing. We are discussing how we can integrate the booklet and our experiences in the faculties' student mentoring approaches and workshops for design tutors.

In the tutor validation talks, several suggestions were given to improve design education, design learning, and design teaching. We were surprised that the tutors were extremely positive about the talk itself – and missed it in their normal lives as tutors – to take a step back and discuss more intensively (for about 90 minutes) a certain topic relevant for their educational practice. They said that it is the exception rather than the rule to have peer discussions and/or peer feedback (such as intervision among teachers). They made a distinction between 'normal' tutor instructions and assessment alignment sessions on the one hand (which happen a lot), and this kind of more reflective discussion and exchange of thought and ideas we had during the validation talks. An interesting suggestion that was given was about more explicitly rewarding students – in the assessment strategy – who dare to experiment, be pro-active, and be divergent. The idea here was to both challenge and support students to feel okay when feeling less comfortable.

Limitations of the study and special circumstances

In our project, we only looked at the first year's IDE and ABE undergraduate's design programs. Of course, the relations to and the impact of/on the other first year's courses are also interesting and relevant to consider. Additionally, reviewing what happens in the follow-up years in the design curriculums is also worthwhile to research, as we expect increasing stress levels when students have become an integral part of a certain teaching and learning culture. But with our limited resources, we thought it made sense to start at the beginning of the beginning: the first-year design education programs.

In the course of the 2019-2020 academic year we all, students and staff, experienced the uncertainty and stress of the Covid-19 pandemic. This impacted the students, tutors, educational management, the learning environment, and society in unprecedented ways. In our questionnaire, we immediately integrated questions on how the pandemic influenced the study experiences. Logically most of the students told us that studying design became more stressful, harder, and less fun. But, also some students told us the positives; several technical tools that support exchange and presentation, visual feedback, and peer assessment were highly appreciated. They improved and stimulated design learning. From that point of view, it will be interesting to observe if and how our 'traditional' studio model for learning and teaching design will (not) change into a more blended one in the future, as it became clear to many that design education benefits a lot from informal peer-to-peer and expert-to-peer learning when students and tutors are sitting together physically.

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APPENDIX 1 STUDENT QUESTIONNAIRE QUESTIONS

Question 1: During your design project, how often (5-points scale from 'never' to 'very often'):

- Have you felt confident about your ability to handle your personal problems?
- Have you felt that you were unable to control the important things in your life?
- Have you felt that things were going your way?
- Have you felt difficulties were piling up so high that you could not overcome them?

Question 2: In the next question we would like to know if there are factors that influenced your study experience positively (more answers are possible):

- I can keep myself on track according to my planning
- The ateliers/studio spaces
- The way my tutor organized the tutoring sessions
- I experienced moments of success
- There were enough possibilities for my input in my project
- The atmosphere in my group invited me to ask questions
- The presence of deadlines
- The module was manageable within the given time
- The way my tutor gave feedback on my performance
- It was sufficiently clear for me what was expected from me
- I got inspired by my fellow students

Question 3: Please explain your answers to the previous question (open question)?

Question 4: In the next question we would like to know if there are factors that influenced your study experience negatively (more answers are possible):

- I tend to procrastinate
- The way my tutor organized the tutoring sessions
- The ateliers/studio spaces
- The level of the module is too high
- I experienced too little freedom for my design choices
- I had the feeling that I never do good enough
- The presence of deadlines
- The lack of enough time (the workload was too heavy
- The way my tutor gave feedback on my performance
- Unrealistic expectations from my tutor
- The feeling of competition among students

Question 5: Please explain your answers to the previous question (open question)?

Question 6: What could have strengthened your study experience during the design project (open question)?

BIOGRAPHICAL INFORMATION

Remon Rooij PhD MSc is an Associate Professor of Spatial Planning & Strategy, education leader of the department of Urbanism, and the TU Delft educational co-leader of the Dutch 4TU Centre for Engineering Education. From 2012-2020 he was the program leader of the TU Delft Bachelor of Architecture, Urbanism & Building Sciences program (1,400 students). Remon leads the faculty's research-on-education-innovation initiative, which focuses on design education, academic skills for design-oriented students, interdisciplinary and transdisciplinary education, online and blended education, and curriculum (re)design and educational leadership.

Sylvia Mooij PhD MSc a senior Lecturer at the Design, Organisation & Strategy department of the faculty of Industrial Design Engineering. She is the program leader of the TU Delft Bachelor of Industrial Design Engineering (1,000 students). She is responsible for the Bachelor's program and keeps track of (educational) developments to implement in the curriculum to keep it up-to-date and future-proof. Since 2021 she has been the academic portfolio director of Engineering Skills at the TU Delft Extension School for online continuing education.

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