The Corona transition and student learning

Second Express Report - December 2020

Student well-being and influencing factors

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(Deliverable 2A: mid-term effect of transition)

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Introduction

On March 12, Eindhoven University of Technology changed learning and teaching drastically, as a response to the Corona crisis. Since then, students mainly learn online from home. In a previous report we described the first results of a study on students' experiences during the transition to online learning (third quartile, Q3) and when all teaching was provided online (fourth quartile, Q4). The current report contains a follow-up analysis of the survey sent out in Q1 of the new academic year. The survey was sent to students from the department of Industrial Engineering and Innovation Sciences (IE&IS) to obtain insights into their experiences with online learning in one specific course they had followed in Q1, and their general well-being .
In this quartile, TU/e provided the vast majority of teaching and most of the examinations online.

The following questions are answered in this report:

1. *What is the current situation regarding the well-being of the students at IE&IS?*
2. *Are there differences in well-being between female vs male students, bachelor vs master students, and Dutch vs non-Dutch students?*
3. *How do the well-being findings compare to those obtained for Q3 & Q4?*
4. *Which factors are related to student well-being (home situation, learning strategies, resource-seeking, teacher communication & support, autonomy)?*

The survey

Sample

In total, 1819 students were invited for this Q1 survey. In all, 891 students replied (49%) and 679 students followed at least one course and completed the full survey (final response rate 37%, of which 44% were female and 7.5% have a non-Dutch nationality). Most questionnaires were completed between October 19 and November 13, 2020. An overview of the full sample of 679 students per program can be found in Figure 1.

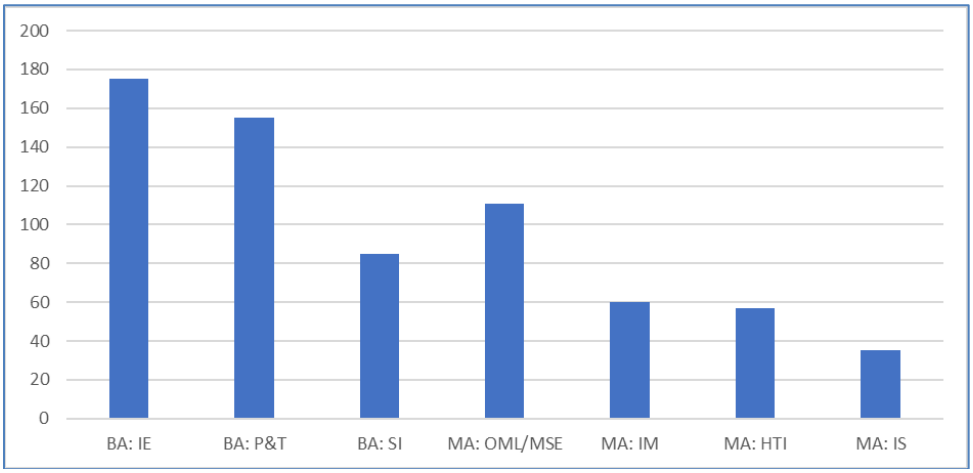

Figure 1. Overview of the sample for the Q1 survey

Well-being indicators
The survey contained the following seven measures of well-being: study engagement (a positive, fulfilling, study-related state of mind that is characterized by vigor, dedication, and absorption), burnout (specifically the degree to which students experience exhaustion), loneliness, depression, worrying, concentration, and amotivation (lacking a clear motivation for studying and remaining in the program).

Potential Influencing factors
The survey contained four groups of influencing factors:
- Home situation: lack of suitable study space, health issues, care for family members, conflicting work schedules
- Learning strategies: related to time-management, persistence, and using a suitable study environment
- Resource-seeking: proactively seeking support from fellow-students and teachers/tutors (social), as well as seeking resources online (non-social)
- Course-related: teacher communication & support, and autonomy

Student well-being

For the seven well-being indicators, Table 1 provides an overview of the mean scores, standard deviations and the percentage of the students that have extremely low (problematic) scores.

Table 1. Overview of reported well-being

	scale	Mean	SD	% Problematic*
Study Engagement	1-7	4.03	1.05	8%
Burnout	1-7	4.18	1.05	12%
Loneliness	1-4	2.12	0.64	3%
Depression	1-4	2.50	0.70	11%
Worrying	1-4	2.42	0.70	9%
Concentration problems	1-4	2.41	0.50	4%
Amotivation	1-7	2.34	1.30	14%

* Often (≥3.50 on a 4-point scale), agree/strongly agree (≥ 5.50 on a 7-point scale), except for study engagement (disagree/strongly disagree, ≤ 2.33) and amotivation (≥ 4.00 on a 7-point scale)

Study engagement
Study engagement was measured by three validated questions: 'When I was studying, I felt bursting with energy', 'I was immersed in my studies', and 'I was enthusiastic about my studies' that tapped into the vigor, absorption, and dedication facets of study engagement. The mean score is at the midpoint of the scale (4.02; SD = 1.05). Approximately 8 percent of the students disagree or strongly disagree with the statements (≤ 2.33), whereas approximately 6 percent agree or strongly agree with the statements (≥ 5.67). The distribution of responses is shown in Figure 2.

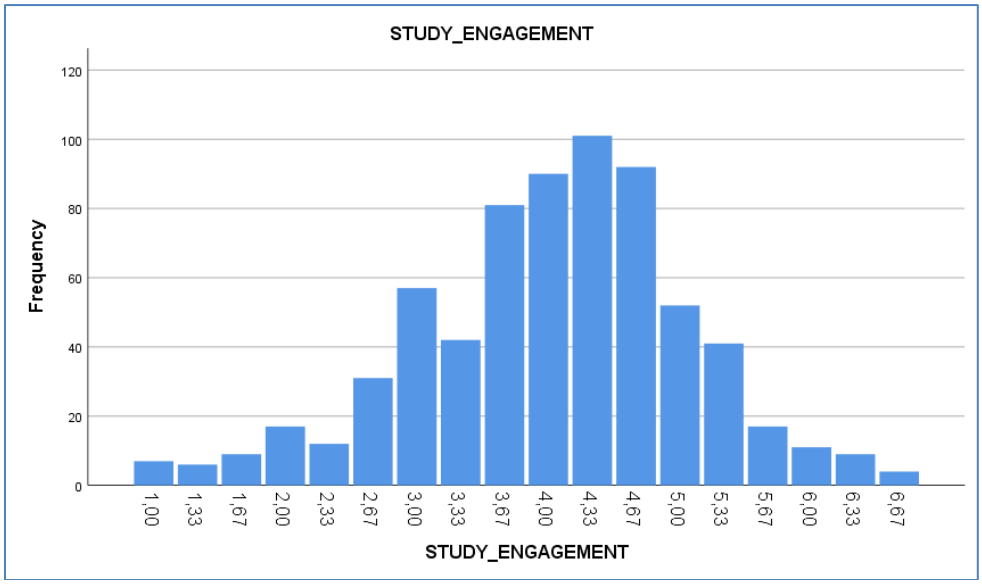

Figure 2. Students' reported study engagement (3-item scale)

Differences between groups. Male students report slightly higher engagement than female students (M=4.12 vs M=3.92, p=.01). Study engagement does not differ between bachelor and master students (M=4.00 vs 4.05) or between Dutch and non-Dutch students M=4.02 vs M=4.16).

Burnout

In measuring burnout, we focused on *exhaustion* (because the other facet of burnout – disengagement – is covered by study engagement). The average student experiences relatively low-to-moderate signs of burnout (M=4.18, SD = 1.05), but about 12% agrees or strongly agree with eight statements about burnout, such as 'While I was studying, I often felt emotionally drained' and 'There were days when I felt tired before I joined the online class or started studying', indicating a higher risk of burnout (see Figure 3).

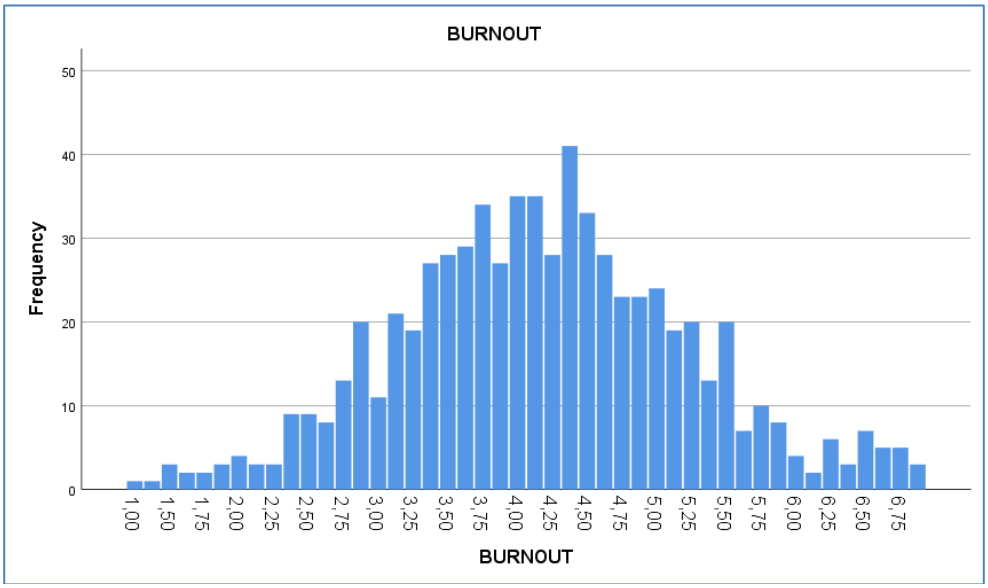

Figure 3. Students' reported burnout (8-item scale)

Differences between groups. Female students on average experience higher levels of exhaustion than male students (M=4.52 vs 3.91, p<001), and so do non-Dutch students compared to Dutch students (4.50 vs 4.15, p<.01). There is no difference between bachelor and master students (4.17 vs 4.20).

Loneliness

We measured loneliness with eight questions including 'I lacked companionship' and 'I felt isolated from others' on a four-point scale: never (1), rarely, sometimes, often (4). On average, students rarely experience loneliness (M=2.12). Nevertheless, approximately 3 percent of the students indicate that they are often lonely. See Figure 4.

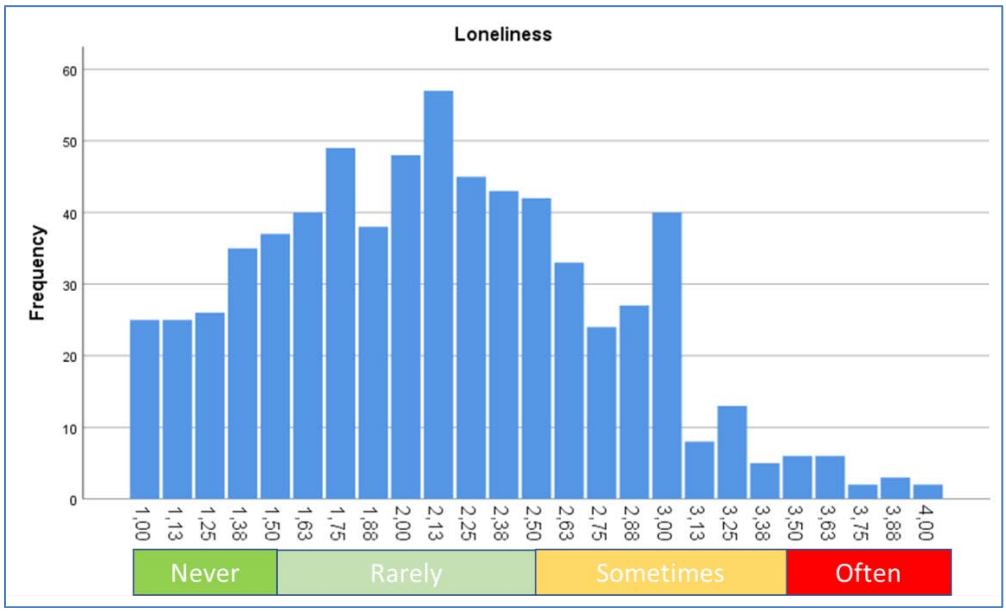

Figure 4. Students' reported loneliness

Differences between groups. Female students report on average slightly higher loneliness than male students do, (M=2.21 vs 2.05, p=.002). There are no differences between the programs or between Dutch and non-Dutch students.

Depression

We measured depression with eight questions including 'I felt nervous or tense' and 'I felt hopeless about the future' and 'I felt unhappy, sad, or depressed', on a four-point scale: never (1), rarely, sometimes, often (4). On average, students rarely to moderately experience depression (M=2.50). Approximately 11 percent of the students indicate they are often lonely. See Figure 5.

Differences between groups. Female students report on average substantially higher depression than male students do (M=2.77 vs 2.28, p<.001). There are no differences between the programs. Non-Dutch students report higher depression scores than Dutch students (M=2.71 vs 2.47).

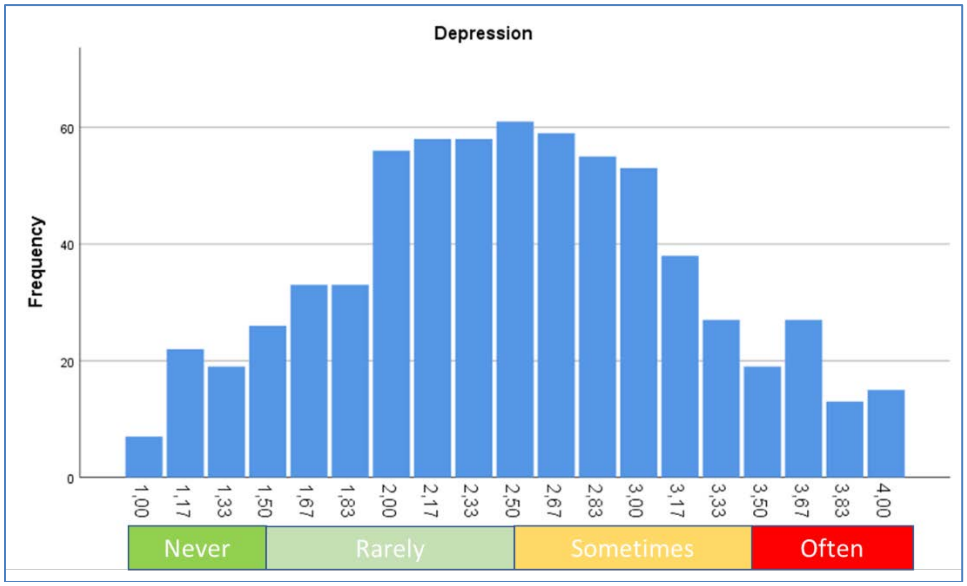

Figure 5. Students' reported depression

Worrying

We measured worrying with four questions including 'When I stopped studying I continued to worry about study issues' and 'I often lay awake at night because my study haunted me, on a four-point scale: never (1), rarely, sometimes, often (4). On average, students rarely to moderately experience worrying (M=2.42). Approximately 9 percent of the students indicate that they worry often. See Figure 6.

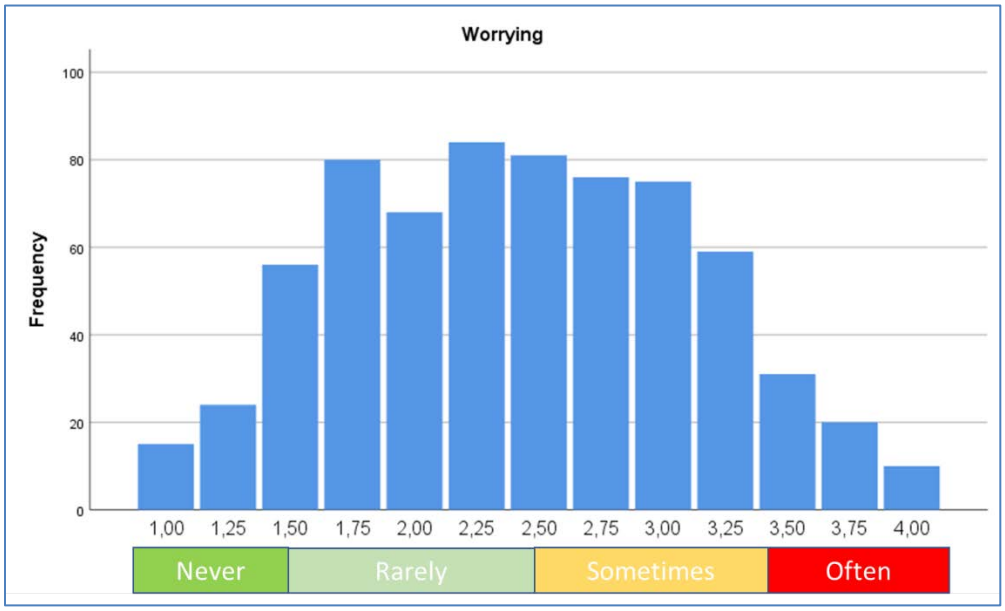

Figure 6. Students' reported worrying

Differences between groups. Female students report a substantially higher level of worrying than male students do (M=2.66 vs 2.24, p<.001). Master students worry slightly more than bachelor students do (M=2.51 vs 2.37, p=.014). Non-Dutch students report higher worrying scores than Dutch students do (M=2.75 vs 2.40, p=.001).

Concentration problems

We measured concentration problems with four questions, e.g., 'My mind wandered a lot when I studied', on a four-point scale: never (1), rarely, sometimes, often (4). On average, students rarely to moderately experience concentration problems (M=2.41). Only about 4 percent of the students indicate that they often have concentration problems. See Figure 7.

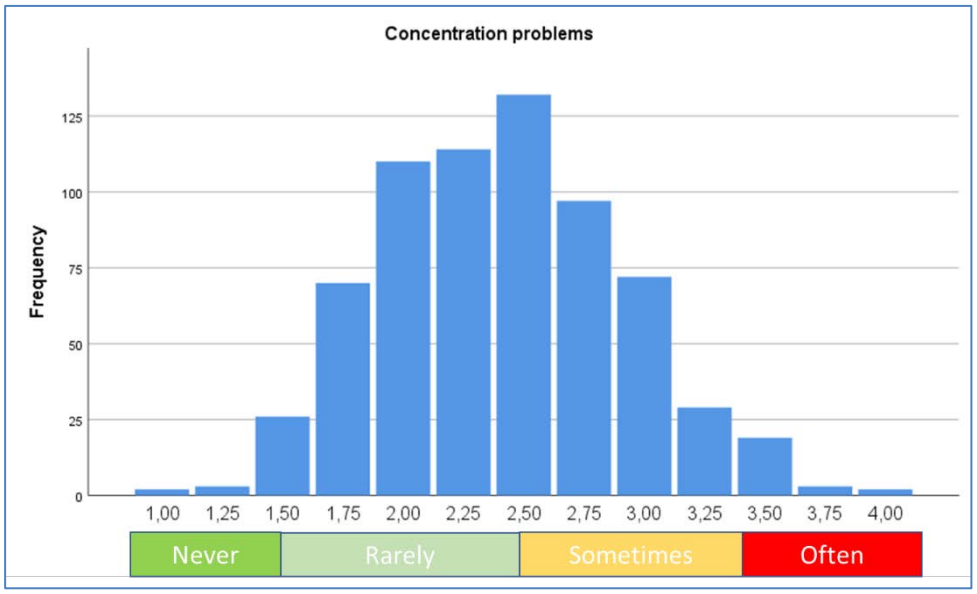

Figure 7. Students' reported concentration problems

Differences between groups. Female students report slightly more concentration problems than male students do (M=2.48 vs 2.35, p=.002). There are no differences for bachelor vs master and Dutch vs non-Dutch students.

Amotivation

Amotivation refers to the lack of a specific motivation for studying at TU/e, measured with four questions including 'I really felt that I was wasting my time at university', and 'I once had good reasons for going to university; however, in Q1 after the transition, I wondered whether I should continue.' On average, students rarely to sometimes report this lack of motivation (M=2.34 on the four-point scale). See Figure 8. Although only 2.5% of the respondents report very high levels of demotivation (≥ 5.50), 14% have a score of 4.00 or higher, indicating that they do not disagree with the rather extreme statements posed to them.

Differences between groups. Female and male students do not differ in their levels of amotivation (M= 2.30 and 2.38). Master students report a higher level of amotivation than bachelor students do (M=2.49 vs 2.25, p=.016). There are no significant difference between male and female students (M=2.30 vs 2.38) or Dutch and non-Dutch students (M=2.32 vs 2.45).

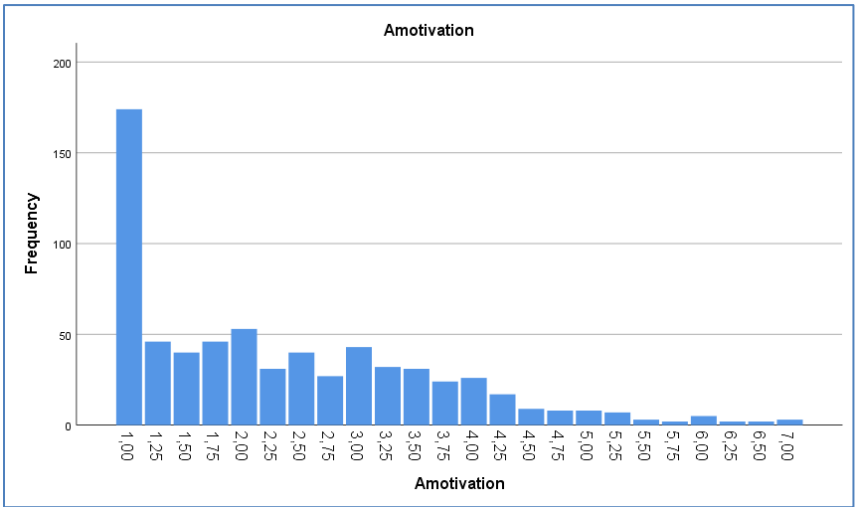

Figure 8. Students' reported amotivation

Comparison with Q3 and Q4 of the previous academic year

A comparison of mean scores and extreme ('problematic') scores is provided in Table 2.

Table 2. Overview of reported well-being

		Q1			Q3/Q4		
	Scale	Mean	SD	%"Problematic"[+]	Mean	SD	%"problematic"[+]
Study Engagement	1-7	4,03	1,05	8%	3,79	1,08	13%
Burnout	1-7	4,18	1,05	12%	4,15	1,10	11%
Loneliness	1-4	2,12*	0,64	3%	2,91*	0,62	23%
Depression	1-4	2,50	0,70	11%	2,49	0,70	10%
Worrying	1-4	2,42	0,70	9%	2,52	0,76	13%
Concentration problems	1-4	2,41	0,50	4%	2,46	0,53	4%
Amotivation	1-7	2,34	1,30	14%	2,35	2,35	15%
Home situation issues	1-7	2,26	1,21		2,33	1,20	
Learn. strat.: time	1-7	4,47	1,17		4,36	1,19	
Learn. strat:. persistence	1-7	4,66*	0,95		4,38*	0,97	
Learn. strat.: environment	1-7	4,94	1,14		4,84	1,16	
Seeking social resources	1-7	3,88	1,18		3,70	1,09	
Seeking online resources	1-7	5,22	1,02		5,17	1,02	
Teacher comm & supp	1-7	4,83	1,03		n/a		
Autonomy	1-7	4,87	0,87		n/a		

[+] Often (≥3.50 on 4-pt scale), agree/strongly agree (≥ 5.50 on 7-pt scale), except for study engagement (disagree/ strongly disagree, ≤2.33) and amotivation (≥ 4.00 on 7-point scale); *Means are significantly different (p<.001)

Of the seven well-being indicators, only one has changed significantly from the Q3/Q4 survey to the Q1 survey: *loneliness* has decreased substantially, from 2.91 to 2.12 (p<.001). In line with this, the percentage of students with very high scores dropped from 23% to 3%. There does not seem to be a

single explanation, as influencing factors such as the home situation and seeking social resources do not seems to have changed. The broader context has changed, though, from completely online education and examination when the Q3/Q4 questionnaire was filled in (between June 24 and July 7) to more hybrid education and on-campus group work opportunities when the Q1 questionnaire was filled in. The fact that the Q1 questionnaire was completed after a summer period in which the corona measures had been relaxed may have played a role as well.
Regarding the influencing factors, only the *persistent learning strategy* has increased somewhat (M=4.66 vs 4.38, p<.001), which suggests that students persisted in taking part in online classes, studying materials, in the face of obstacles that the (largely) online way of working posed.

Factors related to student well-being

In the survey, we included eight factors that may explain the well-being results that have been found for Q1. Each factor was measured with 4 to 8 questions to attain sufficient reliability.

These factors are:

1. *Home situation issues* (lack of suitable study space, health issues, care for family members, conflicting work schedules)

Learning strategies:

2. *Time-management* (e.g., I made good use of my study time for this (online) course.)
3. *Persistence* (e.g., When I was feeling bored studying for this online course, I forced myself to pay attention.)
4. *Using a suitable study environment* (e.g., I had a regular place set aside for studying in this (online) course.)

Resource-seeking:

5. *Proactively seeking support from fellow-students and teachers/tutors* (social)(e.g., I asked fellow students who take the same course for help when I needed it / I asked the course teacher(s) (or tutors, teaching-assistants) for help when I had trouble understanding a topic or carrying out an assignment
6. *Seeking resources online* (non-social)(e.g., When faced with a difficult question or problem, I looked for (online) resources provided in the course that may have contained the answer or solution)

Course-related:

7. *Teacher communication & support* (e.g., Overall, the instructor for this course helped to keep students engaged and participating in a productive dialog.)
8. *Autonomy* (e.g., I could decide on my own what to work on during the course weeks)

For each of the well-being outcomes, a regression analysis was conducted with all eight factors as predictors. Table 3 (next page) shows the significant predictors for each well-being outcome, with the numbers representing standardized regression weights (β). A green score represents a positive (i.e. a good) effect; an orange score represents a negative (i.e. a bad) effect.
Judging from the table, two factors are related to (almost) all well-being outcomes. Firstly, *issues in the home situation* are related to all negative outcomes. The issues included in this measure are quite varied (lack of suitable study space, health issues, care for family members, conflicting work schedules) and the issue(s) that are playing a role may differ among students[1]. Conversely, students that experience a higher

[1] An examination of the correlations of the four individual issues reveals that health issue typically has the highest correlations with the six well-being outcomes (.25 / .40), followed by a lack of dedicated study space (.17/.31). The correlations are lower for care for family members (.06 / .22) and conflict with work schedules (.12 / .21). However, in almost all cases they are still statistically significant.

degree of *autonomy* in a course report higher well-being for all indicators (higher study engagement, lower burnout (exhaustion), etc.). A likely explanation may be that autonomy can be seen as a resource that allows students to better handle study workload and study pressure.

Table 3. The relation between home, student, and teacher/course factors and well-being outcomes

	Study engagement	Burnout (exhaustion)	Loneliness	Depression	Worrying	Concentr. problems	Amotivation
Home situ-ation issues		.21**	.20**	.29**	.24**	.09**	.24**
Learn strat: time	.13**	-.11*				-.28**	
Learn strat: persistence	.19**					-.27**	
Learn strat: environment		-.13**					
Seeking social resources	.12**		-.16**				
Seeking online resources		.10*		.10*	.11**		
Teacher comm & supp	.08*					-.08*	
Autonomy	.25**	-.28**	-.11**	-.19**	-.21**	-.18**	-.22**
Variance explained+	25%	28%	11%	19%	15%	36%	19%

N=671, *p<.05; **p<.01; +The percentage of variance in the well-being outcome that is accounted for by all predictors.

The other factors are related to fewer well-being outcomes. For example, *seeking social resources* is positively related to study engagement and negatively related to loneliness. Latter relation is expected as seeking social resources obviously involves increased interactions with other students and/or teachers, which is likely to decrease feelings of loneliness.

It should be mentioned that the current survey does not allow for causal conclusions, because both the factors and the well-being outcomes were measured at the same point in time. This may explain the negative role of seeking online resources. Perhaps it is not the seeking of online resources that leads to higher burnout, depression, and worrying, but the other way around: perhaps students that are exhausted, depressed or worrisome turn more to online resources. Something similar may hold for the relation of concentration problems with time-management and persistence. For example, concentration problems may lead to poorer time management and not the other way around.

Because female students and non-Dutch students report lower wellbeing than male and Dutch students, we compared the results for the influencing factors for these groups of students. It turns out that female students report more home issues (specifically lack of dedicated study space: 3.04 vs 2.57, and health issues: 2.41 vs 1.89), as well as lower perceived autonomy in courses (4.76 vs 4.96) than male students. Non-Dutch students report more home issues (specifically health issues: 2.71 vs 2.08, and caring for family members: 2.65 vs 1.79) than Dutch students. They also show less persistence in learning (4.64 vs 5.06) and seek less online resources (5.19 vs 5.59).

Answers to the research questions

This second report has provided a structured analysis of seven aspects of student well-being and factors related to these aspects. Regarding the first research question, the results show that although the mean scores for the seven well-being indicators may not be a cause for concern, up to 14 percent of the students have extreme scores that indicate that they often experience feelings of (especially) burnout, depression, and amotivation.

With respect to the second question, female students experience more well-being issues than male students do on six of the seven indicators, with substantially higher (more problematic) scores for burnout (exhaustion), depression, and worrying. Differences between bachelor and master students, and between Dutch and non-Dutch students are smaller. However, non-Dutch students experience higher burnout (exhaustion), depression, and worrying than Dutch students.

Regarding the third question, student well-being hardly changed compared to the findings on Q3 and Q4 of the previous academic year. One exception is loneliness, which decreased substantially, perhaps due to the summer break with less strict COVID regulations, the more hybrid teaching in Q1, or students finding online alternatives to have social contacts. Although the group of students with extreme scores appears to have decreased slightly (e.g., from 13% to 8% for study engagement), there still is a group of students with potentially problematic levels of burnout (exhaustion), depression, and amotivation.

The findings on the influencing factors - the focus of the fourth question - point toward potential causes and remedies. The most important factor that appears to increase study engagement and reduces all problematic well-being aspects is autonomy. This relates to how courses are structured: courses with fewer deadlines and more freedom in choosing what to do when and a lack of immediate pressure appear to be beneficial, likely because it offers students the opportunity to deal with the circumstances. For both female and non-Dutch students, home situation issues appear to play a role in their lower well-being.

Conclusion and future work

A general conclusion regarding the well-being of IE&IS students would be that, overall, the likely negative effects of the prolonged COVID-19 restrictions and the likely positive effects of the slightly relaxed COVID-19 regulations and concomitant introduction of some on-campus activities in Q1 have kept each other in check. The only substantial improvement occurred for loneliness. Especially female and non-Dutch students appear to be vulnerable due to a more problematic home situation. This issue is difficult to address as some solutions (e.g. offering more students the opportunity to work at TU/e) are dependent on the COVID-19 developments. Nevertheless, helping students in their time-management, creating more autonomy for students in courses, and making it easier for students to get help from fellow students and teachers are possibilities to reduce well-being problems.

This report has not focused on what happened within specific courses, although we did collect data on this. For the next steps, we intend to connect these data to the course characteristics to be able to provide more concrete suggestions on how online teaching could be improved. In addition, we will collect actual click-stream data from Canvas and continue surveying the student population to be able to further examine how these behaviors and perceptions develop over time.
