The Corona transition and student learning

What works, what doesn't work, and what needs improvement?

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4TU. CENTRE FOR ENGINEERING EDUCATION

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What works, what doesn't work, and what needs improvement?

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On March 12, Eindhoven University of Technology decided to change learning and teaching drastically, as a response to the Corona crisis. Since then, students learn online from home. This report describes 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). All students from the department of Industrial Engineering and Innovation Sciences (IE&IS) were invited to participate in a survey to describe their experiences with online learning in one specific course they had followed in Q3 or Q4, and answered questions about their life in general. In total, 957 students were invited for the Q3 survey and 772 students were invited for the Q4 survey. For the Q3 survey, 346 students replied (response rate of 36%) and 302 students followed at least one course and completed the full survey. For Q4, 286 students replied (response rate of 37%), and 202 followed at least one course and completed the full survey. An overview of the full sample of 504 students[1] can be found in Figure 1.

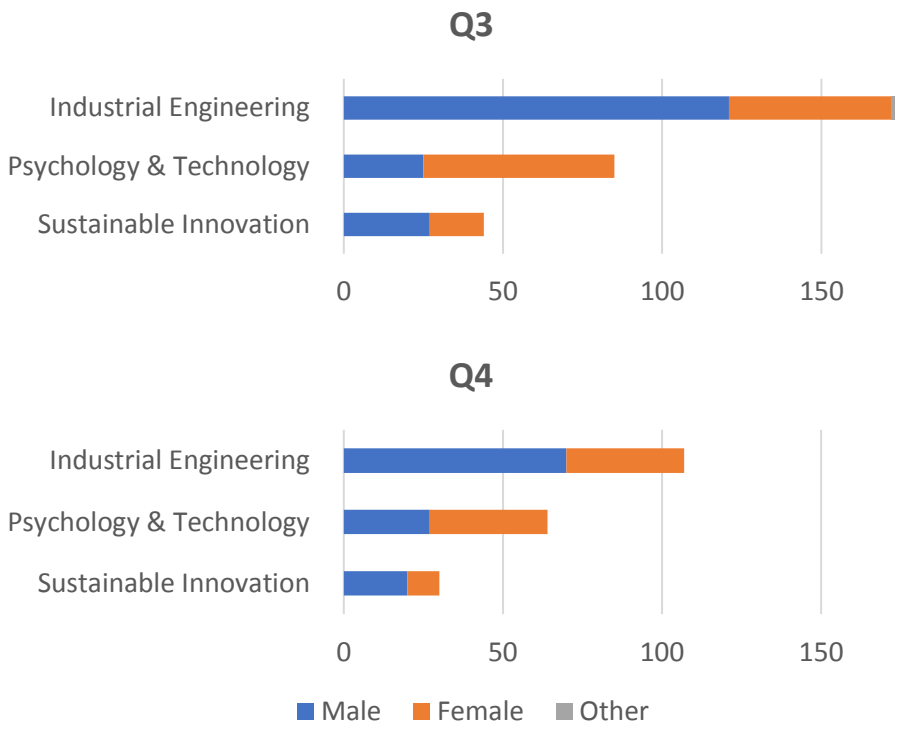

Figure 1. Overview of the sample for the Q3 and Q4 survey

[1] Due to the length of the survey, there were different variants, where students received a subset of the questions. Therefore, for some questions the sample size is lower. We report only those results for which an adequate amount of replies was received.

The transition to online learning (Q3)

Because of the transition to online teaching, students faced dramatic changes in their education: a sudden change to completely online learning, executed by teachers who had prepared for different kinds of courses. In addition, learning had to be done from students' homes, which did not always prove to be optimal working environments and led to a variety of difficulties.

Two-thirds (68%) of the students encountered difficulties due to the transition towards online education (see Figure 2). Most of these issues were related to a problematic working environment, including issues related to noise, having no dedicated study space, sluggish or unreliable internet, and having too many people in one room during students' learning. Only a couple of students indicated difficulties due to having to care for children/housemates or because of health issues. The transition also seems to have had financial impacts, but only to minority of students. A few students encountered financial issues in the last term (7%). Very few students took out a loan specifically due to Covid-19 (2%), but several students did have to increase their existing loan (17%).

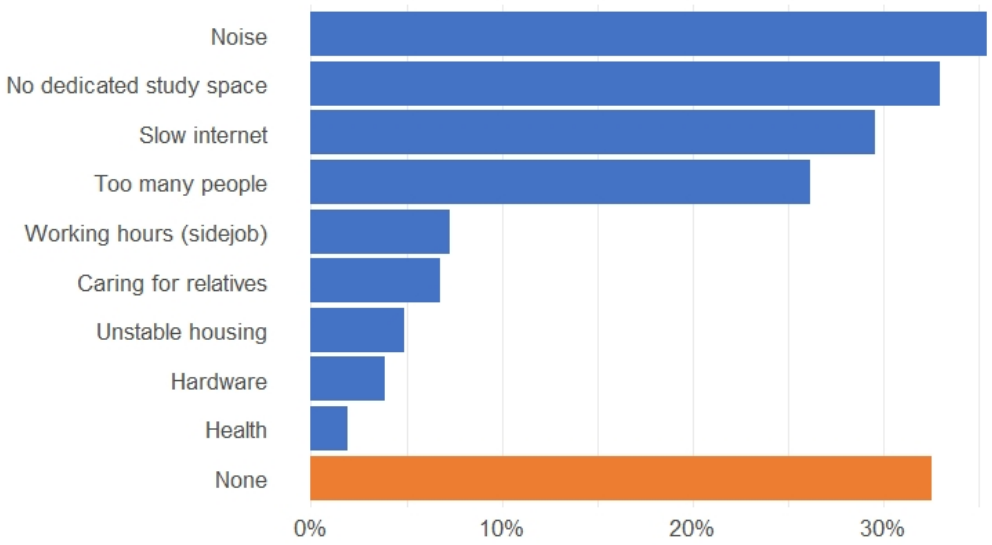

Figure 2. Difficulties encountered during the transition to online learning.

Regardless of the difficulties, the bulk of the students did not seem require more effort to complete their coursework (M = 3.68 on a 7-point scale, SD = 1.79, see Figure 3a). Still, 35% of the students indicated their coursework took more effort. In addition, they argued that the quality of their work slightly decreased (M = 4.14, SD = 1.68; Figure 3b), with (almost) half of the students indicating that their quality decreased. Also, not surprisingly, students felt somewhat overwhelmed by the transition (M = 4.23, SD = 1.81, Figure 3c). Only 39% of the students reject this proposition, 47% agreed, while 14% felt ambivalent about it. At the same time, students were confident in their abilities to learn well in an online course (M = 4.95, SD = 1.51, Figure 3d). Only 32% of the student felt less confident or were ambivalent about them.

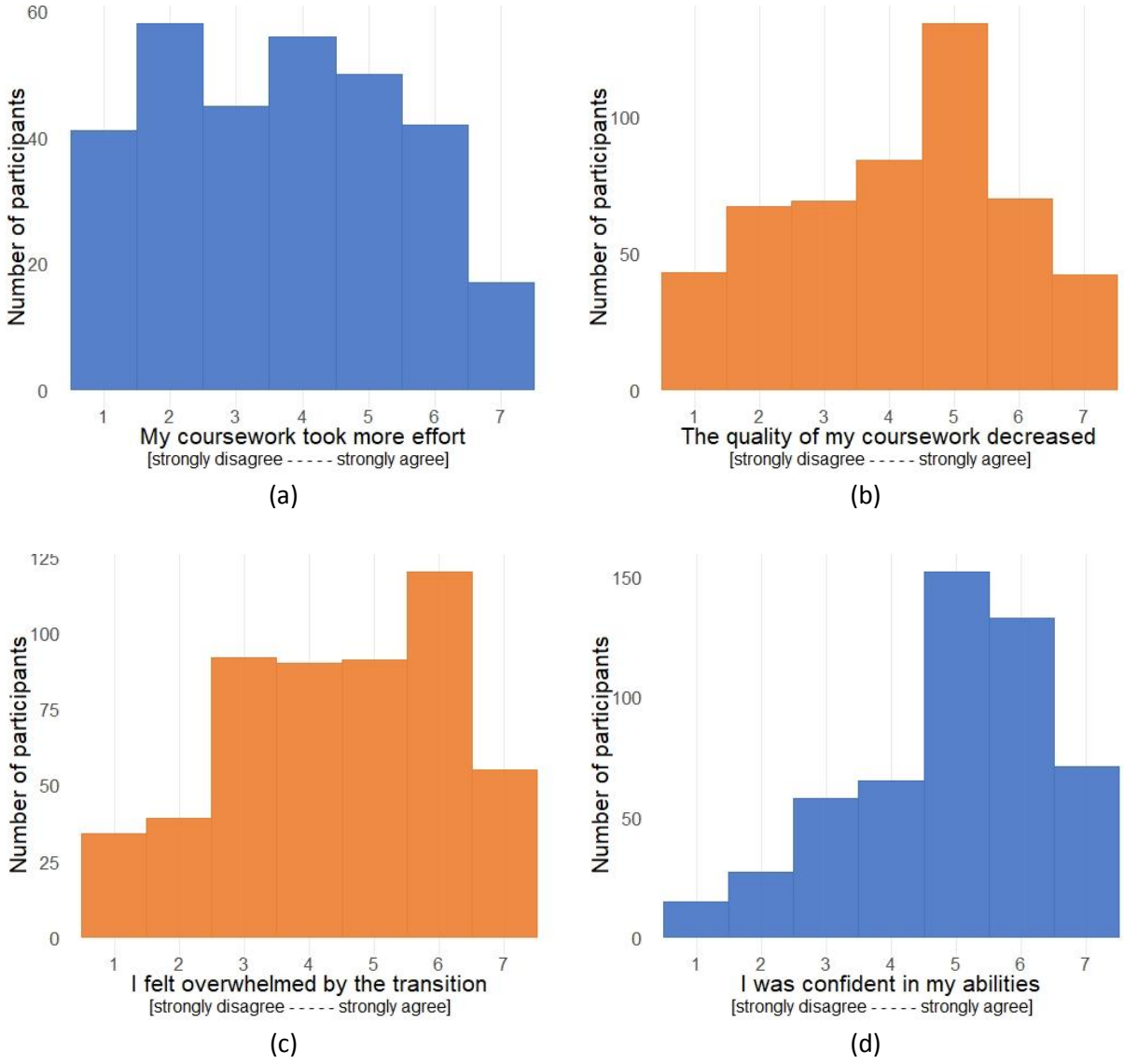

Figure 3. Experiences with transition to online learning

Course changes due to online learning

The students reported several changes within their courses due to online learning. Almost half of the students indicated that classes were cancelled due to the transition to online education. Lectures were cancelled most (70% of the students indicated this), followed by tutorials (33%) and group discussions (15%). Most of the time only one lecture/tutorial was cancelled (40%), but 10% of the students indicated that all lectures were cancelled, and students were asked to read previous materials.

Teachers chose different formats of online learning, including pre-recorded videos, live-streamed lectures, and interactive meetings. However, there was no difference in students' motivation to follow the format (video, online live lecture, interactive session) between these forms. In general, the motivation for each of these formats was relatively low (all *M's* = 3.1 - 3.2). Similarly, the enjoyment of studying for a

course (*M* = 3.9) was unrelated to the intensity of use of pre-recorded video lectures, live-streamed lectures, and interactive sessions.

One-third of the students indicated that the assessment for the course changed. Changes were found in the grading, weight, and form of the assignments. For 26% of the assignments, the grading became more lenient. Interestingly, several students (37%) did not know whether the grading was changed. Students did not believe that the transition to online examination resulted in more misconduct (M = 3.80, SD = 1.56); but they had a slight tendency to think that their instructor was more concerned about cheating (M = 4.36, SD = 1.55). In addition, 9% of the students claimed that they felt tempted to conduct fraud in Q4. Despite the multiple changes in the assessments, test anxiety in Q4 was relatively low (M = 3.89, SD = 1.60, Figure 4). Still, 35% of the students agreed they felt test anxiety. (For Q3, no data on test anxiety is available.)

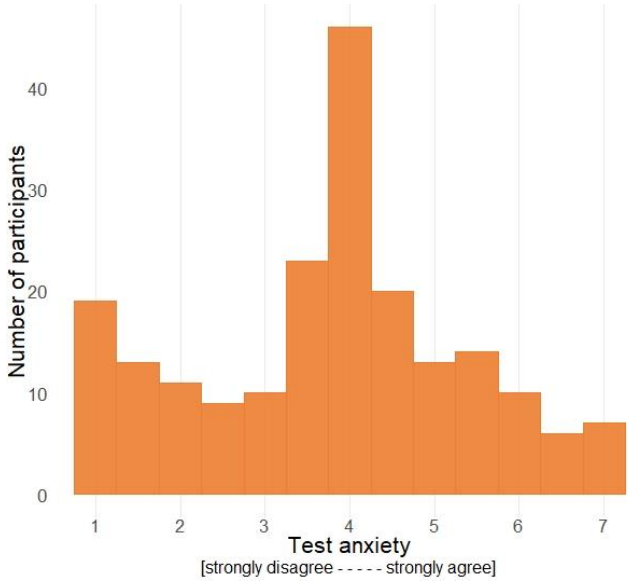

Figure 4. Students' reported test anxiety (4-item scale)

Support

Luckily, there were multiple sources of support received during the transition to online teaching, to help students with all these changes. Students received most support from their peers, followed by the instructor and teaching assistants. Thereafter, they received most support from the faculty, followed by the university. The least support, as far as online learning was concerned, was obtained from family and friends.

The level of support by the instructor (Q3) was rated sufficient, though not good, with an average of 5.80 (SD = 2.23) on a scale from 0 to 10. One-third of the students (34%) rated the support from the instructors as insufficient. Most support from instructors came via written instructions (68%), followed by interactive sessions (31%) and live-stream sessions (31%). A few students indicated they did not receive any support from their instructor (10%).

Teachers' communication especially helped students to feel more confident about their abilities. The more frequently teachers communicated with their students after the transition, the more confident students felt about their abilities (r = .24, p = .02). The frequency of the teachers' communication was not related to students' feeling of being overwhelmed (r = .04, p = .70). In a similar way, the more teachers provided learning support, the more confident students felt about their abilities (r = .33, p < .01), but the amount of support was unrelated to the perception of being overwhelmed by the situation (r = .09, p = .10). The type of learning support seemed to be less relevant, just as long as teachers offered some help. Students whose teachers helped students by providing interactive Q&A sessions felt more confident (M_{diff} = 0.8, p < .01), as did students whose teachers gave written instructions (M_{diff} = 0.4, p = .02). In addition, students enjoyed studying for a course more when they were offered sufficient resources or help to start their learning (r = .36, p < .01). Lastly, teacher support also had a beneficial effect on burnout and test anxiety. Students whose teachers offered more resources and help showed lower scores for test anxiety (r = - .16, p = .02) and burnout (r = - .23, p < .01).

In the open comments on how instructors could improve their support, students indicated they wanted to have clearer and more structured information, especially on the new procedures and formats of the assignments and exams. Communication should be more open and more frequent, where possible with an online Q&A session. Other advice included: use less open questions in online lectures, because it's more awkward to speak up in front of a camera; spread the posting of online lectures (so not all at once, even if you have them), this makes it easier to spread the workload; and provide more guidance in online group work, because students had no idea how to do this online.

Mental well-being

Despite all the support, the transition did affect some students negatively: 14% of the students often worried, 10% of the students often felt depressed, and 4% of the students often encountered concentration problems (see Figure 5). Especially loneliness turned out to be a problem for many students: 48% of the students sometimes felt lonely, and 22% of the students often felt lonely. No improvement was found in terms of depression, concentration problems, worrying, and loneliness between quartiles 3 and 4.

When we measure symptoms of burnout (using the Oldenburg Burnout Inventory), we see a similar picture. The average student experiences relatively few signs of burnout, but there nevertheless is a substantial percentage that does. About 25% of students score '6' or '7' on the 7-point scale and about 5% of students score '7' (see Figure 6).

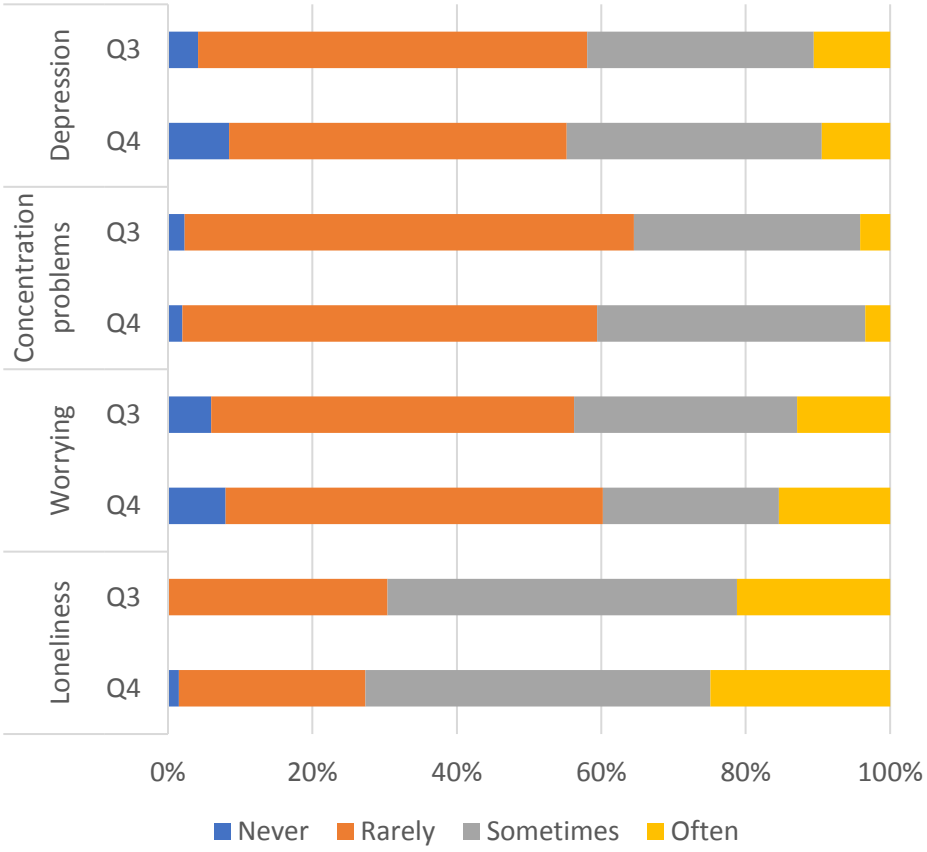

Figure 5. Students' mental well-being

Women seem to suffer from burnout symptoms more than men ($M_{female} = 4.5$ versus $M_{male} = 4.0$). No statistically significant differences were found according to ethnicity or nationality, although burnout scores are somewhat higher for non-Dutch students. When we analyze burnout as a target variable on a larger set of predictors, we see that—as expected—burnout correlates with feelings of depression, having sleeping problems, and generally worrying. Several student characteristics seem to correlate with *less* burnout symptoms: students with specific kinds of learning strategies suffer less. For example, students who invest more effort in their time management ($r = -0.33$, $p < 0.01$) and in structuring their learning environment ($r = -0.31$, $p < 0.01$), had fewer burnout symptoms. Furthermore, we see that students who search help from the teacher also suffer less from burnout symptoms. In contrast, seeking help from peers or searching online help does not affect feelings of burnout.

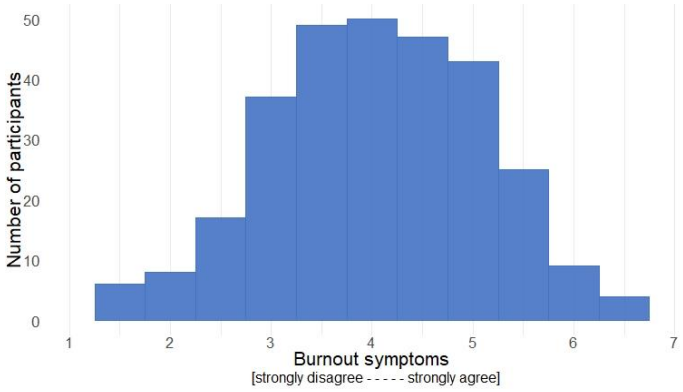

Figure 6. Students reporting burnout symptoms

Future impact

Almost all students (98%) believe that the current transition will have an impact on how teaching will be continued in the future. A large majority believes that there will be more blended courses (87%) and more fully online courses (62%). This is something to be careful about, as several students argued that they would avoid online learning in the future (26%), or that they thought their instructor would avoid online teaching (13%). Only 3% of the students indicated that there would likely be less online education in the future. Students indicated they would be slightly less likely now to follow a fully online course (M= 3.78, SD = 2.07).

Conclusion & Future Work

Within this first report we aimed to provide the preliminary results of a study on students' experiences during the transition to online learning. The results show that although the larger group of students has dealt with the transition to online learning rather well, there is also evidence that there is a substantial, non-negligible group that has suffered. The preliminary analyses indicate that teacher communication and support by the teacher at the start of the online course (or in Q3: immediately after the transition to the online format) affect some learning outcomes. Especially frequent and open communication helps to decrease the negative impacts, as it improves students' confidence in their abilities and study enjoyment. In addition, specific learning strategies of students result in less burnout.

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 detect how these behaviors and perceptions develop over time.