# The Corona transition & student learning: How did it work (and how does Learning Analytics help understanding it better)?

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# Effects of the transition on learning: what do we know?

Earlier research I: emergency remote teaching led to….

- lower quality of learning experience: reduced motivation, less effort & time (Meeter et al., 2020); more delays (ResearchNed , 2020); difficulties in maintaining concentration and engagement during online learning (Petilion & McNeil, 2020); difficult living conditions & lower confidence in learning (Guppy et al., 2022)
- Mostly self-reported data (surveys)

Earlier research II: emergency remote teaching led to…

- higher grades of students who used online tutoring systems and were graded automatedly probably because of more intensive use after lockdown (Gonzalez et al., 2020); higher grades of students who were graded by teachers (Iglesias-Pradas et al., 2021)

# Effects of the transition on learning: our follow-up questions

1. How did emergency remote teaching affect students' learning a) offline and b) on Canvas (online)? Can we replicate the increase in online engagement and grades?
2. Were the changes during the transition period unique for Q3 or typical throughout the period of emergency remote teaching?
3. Was the increase uniform or were some student groups more successful in their adjustments? If yes- which ones?
4. How do changes in offline learning and online learning relate to each other?

# Study design

- random sample of students of one faculty (TU/e, IE&IS) were surveyed at end of Q4 about their experience in Q3 or Q4
- Q3: n=346 (36% response), Q4: n=286 (37% response), but smaller sample sizes for most analyses
- survey data about self-reported changes in learning behavior and experiences
  + Canvas clickstream data (aggregated before vs. after the lockdown)
  + grades

# Effects on self-reported learning in Q3

Compared with the first part of the semester, after courses transitioned to remote instruction…

…*I felt the quality of my work decreased*
disagree: 36.4%  indifferent: 16.6%  agree: 47%

…*I was less motivated to follow the lectures of this course*
disagree: 29.7%  indifferent: 16.9%  agree: 53.4%

…*I was more immersed in my studies for this course*
disagree: 53.4%  indifferent: 31.8%  agree: 14.9%

# Effects on online learning engagement

- How did the transition (during Q3) affect online learning engagement on four indicators?
  - Number of sessions
  - Total session time
  - Mean time between sessions
  - Number of downloads
- Means for weeks 6-8 (after) versus weeks 1-4 (before)
- How does this compare to quartile without transition (Q4)?

# Effects of transition deviate from usual patterns

**T-tests between average weekly values of change indicator beginning and end** Q3

| Canvas indicator | M week 1-4 | M week 6-8 | SD week 1-4 | SD week 6-8 | *p*-value |
|---|---|---|---|---|---|
| Number of sessions (N=181) | 6.74 ↑ | 7.48 | 3.62 | 4.89 | .013 |
| Total session time (N=181) | 78.65 ↑ | 97.45 | 8.48 | 7.51 | .029 |
| Mean time between sessions (N=146) | 114240.5 ↔ | 112536.2 | 6512.23 | 6384.71 | .813 |
| Number of downloads (N=181) | 1.56 ↓ | 1.29 | .09 | .12 | .027 |



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# Effects of transition deviate from usual patterns

**T-tests between average weekly values of change indicator beginning and end** Q4

| Canvas indicator | M week 1-4 | | M week 6-8 | SD week 1-4 | SD week 6-8 | *p*-value |
|---|---|---|---|---|---|---|
| Number of sessions (N=199) | 8.07 | ↓ | 6.70 | .322 | .314 | .000 |
| Total session time (N=199) | 169.42 | ↓ | 120.15 | 10.09 | 10.83 | .000 |
| Mean time between sessions (N=171) | 82027.2 | ↑ | 108411.3 | 4260.99 | 6170.0 | .000 |
| Number of downloads (N=196) | 1.95 | ↓ | 1.25 | .11 | .10 | .000 |

# Changes in offline and online learning in Q3 hardly relate to each other

Correlations between changes in time on Canvas and…

| | | | |
|---|---|---|---|
| quality decreased: | **r= -.07**, | p=.28, | n=217 |
| less motivated: | **r= -.11**, | p=.18, | n=148 |
| more immersed: | **r= +.13**, | p=.10, | n=148 |

# Differences in students' adjustments of online learning

*Regression analysis between survey variables and the change in time spent on Canvas before and after the transition*

| Variable | Mean | SD | Coefficient | T-value | P-value | Beta |
|---|---|---|---|---|---|---|
| Mastery | 4.829 | 1.035 | 2.418 | 2.68 | **0.009** | 1.174 |
| Prove | 3.284 | 1.349 | -0.163 | -0.85 | 0.398 | -0.105 |
| Study engagement | 3.773 | 1.008 | 3.472 | 2.82 | **0.006** | 1.659 |
| Amotivation | 2.676 | 1.494 | -0.063 | -0.35 | 0.739 | -0.045 |
| Mastery * engagement | 18.374 | 6.894 | -0.675 | -2.77 | **0.007** | -2.207 |

*Note*. N = 71, F(5, 65) = 1.75, $R^2$ = 0.119.

Change in time spent on Canvas:

- Stronger increase for those high on mastery goal orientation
- Stronger increase for those with high study engagement



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# No effects of changes on grades

Mixed regression model with standardized change indicators as predictors Q3

| Predictor | Coefficient | *p*-value |
|---|---|---|
| Standardized change in number of sessions | .07 | .604 |
| Standardized change in total session time | -.14 | .228 |
| Standardized change in mean time between sessions | -.19 | .131 |
| Standardized change number of downloaded files | .13 | .191 |
| Overall worrying | -.12 | .419 |
| Overall loneliness | -.11 | .567 |
| N | 145 | |
| N courses | 17 | |
| $R^2$-within | .067 | |
| $R^2$-between | .015 | |
| $R^2$-overall | .043 | |

- Most coefficients in expected direction
- None of the coefficients are significant, however

# Summary & Discussion

- Corona transition reversed the usual pattern of students' learning activities
- Increase in several forms of online engagement (adjustments)
- Contrary to online learning pattern in courses before and after transition
- Differences in students' adjustments: students with stronger mastery learning goals increased online engagement much more
- No effects on grades



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# Summary & Discussion

- Several possible reasons for lack of effects on grades:
  - More lenient grading
  - Lack of relevant learning activities on Canvas
  - Canvas indicators proxies for other (more) relevant cognitive states and attitudes
- Canvas change indicators useful for assessment of (various kinds of) educational interventions
- Canvas change indicators useful for identifying groups of students and potential follow-up interventions