The impact of online education on student dropout during the first wave of COVID-19, analysed by IRT modeling method

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A strategy - if continuing on-line

- Concepts discussed and technical experiments started from the start of spring semester (Feb. 10, 2020),
- Keeping daily routine and student communities alive,
- Keeping students feel engaged during the learning processes,
- Continuing with the same schedule of the lectures - synchronous on-line education (vs asynchronous),
- Methodology recommendations for on-line teaching: how to run interactive, how to motivate students for active learning (100 pages by May, by expert),
- Availability of course material, and recorded, reviewable lectures,
- Continuing with mentoring and with student counselling, for keeping drop-out low.

Preparations for the possible lockdown

- Creation of TEAMS groups for all lectures,
- Set up of OBS streaming servers (for 50+ students courses),
- Checking quality and completeness of Canvas/Moodle courses,
- Procurement of equipment (e.g. laptops, webcams, Wacom tablets, etc.),
- Software installations, ordering internet connections and SIM cards for lecturers,
- Feb 26, 2020: instructions for lecturers for preparation of on-line teaching,
- March 4, 2020 : start of testing the on-line teaching environment in the lecture rooms (in person),
- Delivering all of the lectures in a hibrid way in one week,
- March 12, 2020: lockdown (announced on March 10),
- March 21, 2020 : start of syncronous on-line education.

Drop out prevention program - started before COVID

- First year students are organized in fixed composition groups of 20 students in order to promote community building,
- Student counselling psychologists and peer counsellors,
- Student attendance in all classes is compulsory for all CS students except of well performing ones,
- Obligatory preparation course for university studies and developing learning skills,
- Time-management techniques, soft skills and Computer Science identity,
- Learning techniques on how to study mathematics and programming subjects efficiently,
- Data analytics based reform of curricula,
- Canvas Study Coach for identifying students in trouble,

The challenge of on-line education

Factors which have an impact on drop out:

- Students' personal characteristics, traits, commitment,
- learning style, socioeconomic status, studying skills,
- Isolation vs in person relationships between peers, need for community,
- Affective and cognitive barriers in online learning,
- Home and academic environments are interlaced,
- Time spent on the elaboration of the subjects may increase,
- Preserving mental health - anxiety and high levels of stress,
- Engagement and accomplishment are the key factors in students' success,
- Quality of digital connection,
- Persistence in online courses is regularly 10–20 % lower
- Contradictory results at different universities (e.g. NL, Spain).

Descriptive statistics of first year CS students

- There was no significant difference between students' dropping out who participated in online education (2020) and those who received on-campus education (2019),
- The grade point average of students who participated in online education (2.5) was lower than that of students who participated in on-campus education (3.3).

Table 1 Descriptive statistics of students.

	2018 academic year (on-campus education)	2019 academic year (online education at the spring semester)
Total number of students who started the education	438	447
Number of students dropped out	50	19
Grade point average of the second semester	3.3	2.5

IRT-model on difficulty of the subjects

Item Response Theory (IRT): the relationship between latent traits and their manifestations -
used for the ability of the students related to the difficulty of the subjects, e.g. Mathematical Analysis I. Lecture course

- More students preferred to try the exam even unprepared,
- Obtaining lower passing (2 or 3) grades was easier, too,
- Obtaining good grades (4 or 5) became more difficult.

Analysis I. L.	
≥1 | −1.6	≥1 | −1.8
≥2 | −1.48	≥2 | −1.68
≥3 | −0.230	≥3 | 0
≥4 | 0.572	≥4 | 1.89
=5 | 1.24	=5 | 2.34

There are differences among the (lab/theory/CS/Math) courses.

Change of examination strategies

Teachers might offer some 'compensation' at exams due to non-traditional teaching: e.g.,

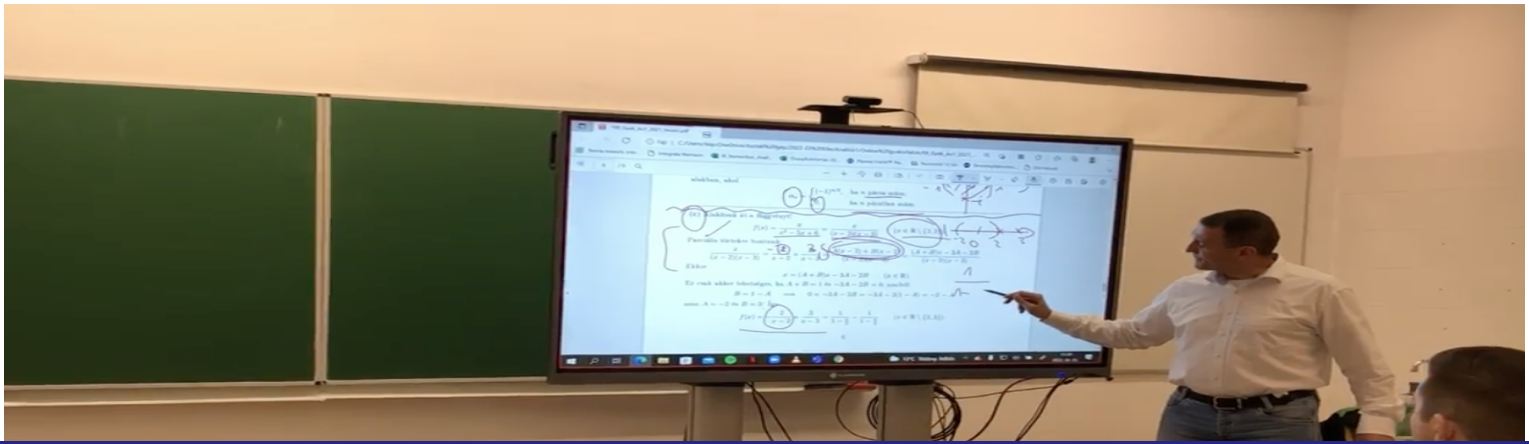
- lowering the score limits by 1-2 points more favourable, or
- accepting answers that would not be accepted in other circumstances.

Students:

- How to obtain a passing grade was clear to the students.
- How to obtain good and excellent grades would have required more serious preparation and self-directed learning in online settings.

Post-COVID

- More support needed for socialization and adaptation of new students to the academic environment, if secondary school time includes lockdown period,
- Higher expectations for application of eLearning methods,
- 14 seminar rooms, 20 labs and 2 auditoriums turned into hybrid rooms,
- Lectures are attended from virtually united auditoriums of different campuses and home.



Conclusions

- Organizational support and flexible structures were needed in order to adapt teaching to the new circumstances set by the crisis,
- Creating an agenda of studying was essential to maintain effective and continuous learning,
- Developing students' skills is neccessary for better resilience in critical situations,
- The process of knowledge transfer moved to online platforms and a different kind of interaction can be applied,
- Long term impact should be considered (data analysis of full study pathes in progress).

Thank you for your attention

Full paper available by open access:
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