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PRIME: a success story in turbulent times

The PRogramme of Innovation in Mathematics Education is all about redesigning mathematics courses for non-math students. As such, it is part of the Interfaculty Teaching from the department of Applied Mathematics (DIAM) at TU Delft (NL). Lecturers, student assistants, coordinators and educational experts are working closely together: PRIME is the result of team effort!

Courses within PRIME are designed following the blended learning cycle: prepare, participate, practice. Educational material is available online, such as: PowerPoint slides, pre-lecture videos, context videos and animations. Applets and the online homework platform [Grasple](#), which provides feedback, are being used by students to practice. Students within PRIME-courses are very active: they are using all abovementioned offered materials and platforms to prepare themselves properly.

The goal for PRIME is not just to teach mathematics, but also to show students that mathematics is an indispensable tool in engineering. By providing examples from engineering, context video's and guest lectures, the students experience the utility of mathematical techniques in their own field of study. For example, PRIME is now developing a context video showing students of civil engineering how differential equations are used in the construction of dikes.

Online education

Due to the current situation, off-campus education is the only way for students to finish this academic year. The transition from on-campus to off-campus education is easier for courses within PRIME than for regular courses. To complete this transition, Collegerama, Virtual Classroom, live streaming options and Questions & Answer sessions are being added to the PRIME-format. To further improve the online education, digital feedback meetings are being set up to collect reactions from students.

Furthermore, all exams will be taken digitally. Currently, lecturers are working hard to set up an exam bank with randomised and parameterized questions. The students have been challenged to stay on track by taking digital progression tests. A positive impact of live streaming on the test results has already been identified. A first analysis showed that students scored significantly better at topics that had been covered in live stream lectures.

Smooth sailing

In these days of online education, cooperation is also the key to reach the goal of connecting mathematics and engineering. For a 3mE course on Probability & Statistics, PRIME invited Wick Hillege to give a guest lecture on the topic of linear regression. Wick has been conducting research at the Laboratory for Ship Hydromechanics at the TU Delft for over five years and has helped to create the Delft Systematic Deadrise Series (DSDS), a database containing measurements of over 350 ship hull-form models tested at different speeds in the TU Delft Towing Tank.

Teamwork did the job in setting up this off-campus guest lecture. After course lecturer Annoesjka Cabo had explained the mathematical theory of linear regression, Wick started his lecture in Virtual Classroom by posing the students a challenge. How can you determine the power of the engine needed to accelerate *Venus*, Steve Job's personal super yacht, to sail at a speed of 22 knots? To determine the required power, the resistance on the ship must be known. In his lecture, Wick explained how researchers at the Towing Tank had used linear regression models to predict the resistance on a ship as a function of several explanatory variables such as its weight and speed. Based on the DSDS database of measurements and this linear model, the resistance on Steve Job's *Venus* could then be calculated. After the lecture, the students had the opportunity to experiment with linear regression models themselves in an online computer assignment, designed by Wick in collaboration with PRIME, using the original data from the DSDS database. How did the students respond to the off-campus guest lecture? Their reactions in the Virtual Classroom chat said it all: 'Wick, thanks a lot. You're a class act!'

In the days of off-campus education, PRIME continues to teach our students the mathematics they need to become the engineers of tomorrow.

