ETH zürich

2022 INNOVATION IN LEARNING AND TEACHING FAIR

WEDNESDAY
4 MAY 2022
FROM 3 P.M.

ETH ZURICH
MAIN BUILDING

5 P.M.
PRESENTATION
KITE AWARD 2022

Editorial

Dear Reader,

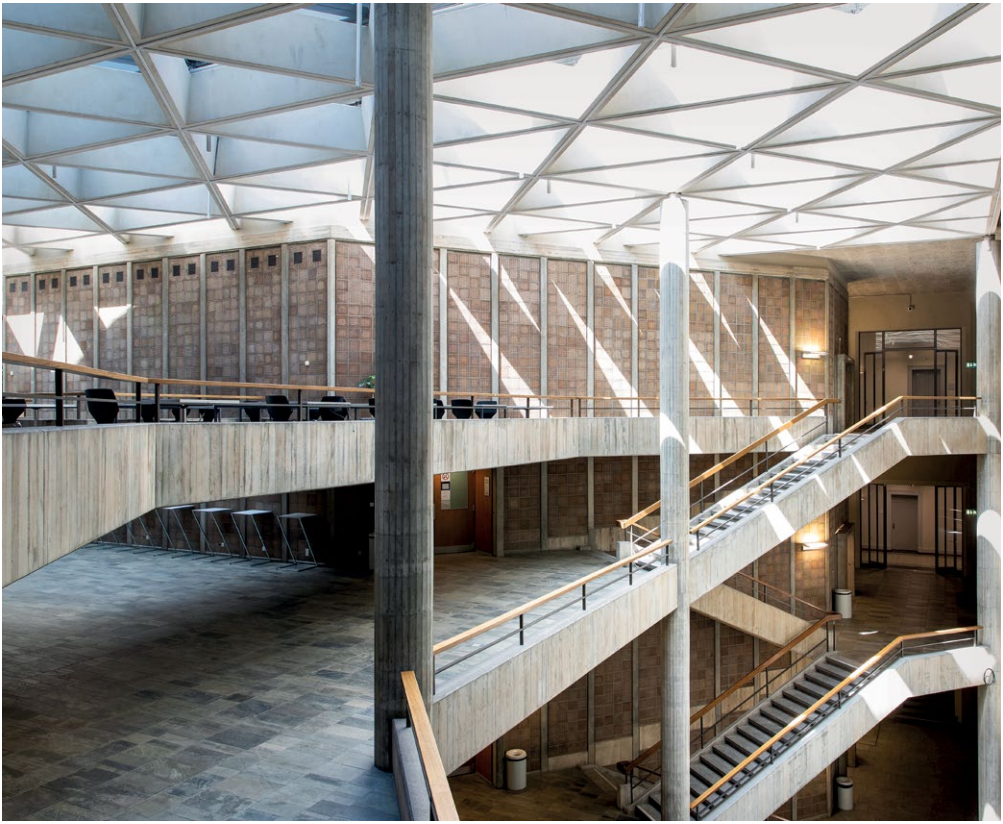
Despite being difficult, the challenges we have faced in recent years have presented us with unprecedented opportunities. We have experimented with new approaches to ensure we maintain the high quality of teaching that is our hallmark. Now, a degree of normality has returned to life on campus, and we are looking forward to seeing everyone face to face again. But we don't want to go back to exactly how things were in the past: some of the changes made during the remote teaching phase have enriched both the way in which we teach and the way in which our students learn. We want to create a platform on which to develop these, and other, novel concepts.

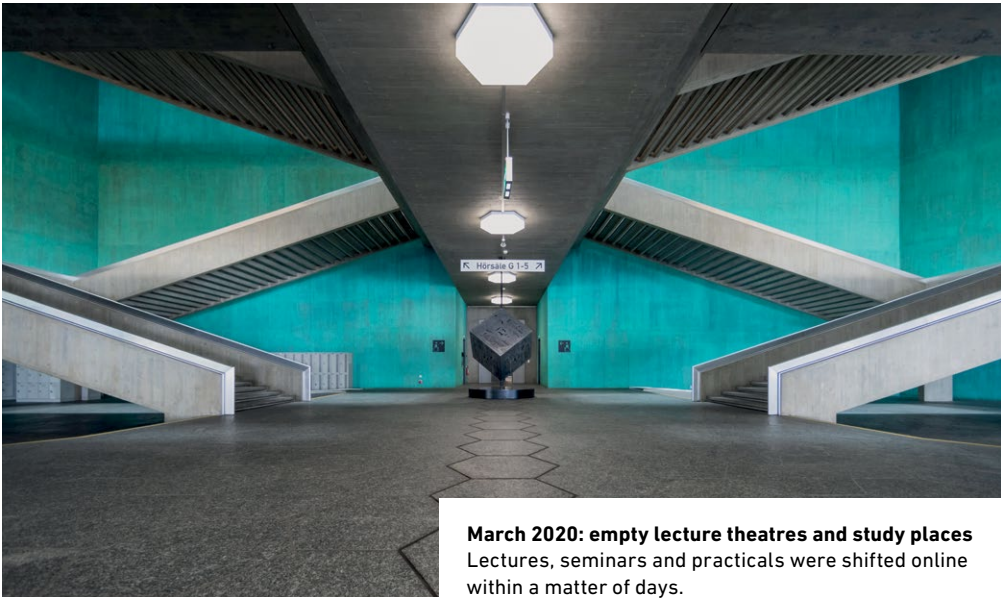
One example is ETH Zurich's new Innovation in Learning and Teaching Fair. This brings together two former events: the Learning and Teaching Fair, where ETH lecturers exchange innovative teaching ideas and projects, and the KITE Award, a prize conferred every two years by the Lecturers' Conference to honour outstanding teaching innovations.

In the afternoon exhibition, 44 projects will provide inspiration and starting points for discussing ideas about the future direction of teaching. For those projects completed over the past two years especially, the main issue is how new teaching formats can best supplement in-person teaching. This is addressed by the three finalists for the KITE Award.

This guide and the website covering the event will hopefully encourage you to find out more. We look forward to seeing you at the Innovation in Learning and Teaching Fair on 4 May!

Professor Günther Dissertori
Rector of ETH Zurich





March 2020: empty lecture theatres and study places
Lectures, seminars and practicals were shifted online within a matter of days.

What is left beyond corona?

by Dr Gerd Kortemeyer, Director of Educational Development and Technology at ETH Zurich

In the short period between 27 February and 12 March 2020, and in response to a mysterious pandemic that could potentially disrupt our operations for a few weeks, ETH Zurich went from making various contingency plans to a complete shutdown of all face-to-face teaching. By 16 March 2020, 95 percent of our teaching activities were completely online – what an achievement!

Granted, this was initially achieved by replicating the lecture hall in the online realm – video streaming, video conferencing, and recordings saved the day. Over time, though, lecturers and students added more tools, partly in an effort to restore interactivity online. We even figured out how to do all, but the most high-stake exams remotely. But just as we became more and more comfortable with educational technology, at the same time, the longing grew to get back together on campus.

Two years later, it looks like the pandemic is finally coming to an end (at least at the time of writing) – what is left beyond corona?

While celebrating the restoration of our on-campus learning community, the effectiveness of some online tools makes it hard to imagine ditching them and reverting completely to traditional teaching. Thus, "the best of both worlds" quickly became the motto: an effective and didactically sound blending of face-to-face and online learning scenarios. There is a caveat, though: an effective response to an emergency is not the same as having a long-term, sustainable strategy. How do we chart the course to this New World? Several of the contributions at the Innovation in Learning and Teaching Fair (and the examples in this booklet) can serve as waypoints.

Blended learning scenarios may substitute some of the face-to-face time used for front-

al lectures and knowledge transmission by asynchronous online components – the pandemic has proven that. This does not mean that we can now pile even more materials on the learners. Instead, this not only frees up face-to-face time for interactivity, but also increases room capacity as we are facing growing student numbers – we create more time and space for more personal interaction between lecturers and learners, as well as for learners among each other.

We could use our limited laboratory capacity more efficiently and guarantee hands-on experiences for all learners by providing preparatory experiences such as familiarisation with the equipment and safety training online. The project by the Department of Physics on laboratory courses being conducted completely at home during corona demonstrates potentially applicable techniques for blended labs. Practical experiments can also be carried out in non-traditional settings, as exemplified by the quadcopter project course devised by the Department of Information Technology and Electrical Engineering D-ITET. Both projects are finalists in the KITE Award 2022.

We could provide more formative assessment, such as quizzes, online homework, or technology-assisted problem-based learning, to give students more feedback on their learning progress earlier on in their studies. Particularly in the first year, this could help new students catch up on identified areas of study, make more informed decisions about their educational goals, and develop more realistic expectations before going into high-stakes summative exams.

Blended scenarios align well with fostering computational competencies, where calculations, simulations, and visualisations can be woven into subject area courses. Finally, online resources can more easily be made accessible to all learners, including those with disabilities, by applying the principles of universal design.

Moving beyond blended scenarios, technology can bridge time and space, as epitomised by another KITE finalist: the contribution from the Department of Management, Technology, and Economics demonstrates the feasibility of virtual field trips to factories. We need to work on bringing together learners and lecturers from different universities, particularly when addressing scientific or engineering challenges on a global scale.

We hope you feel inspired by the projects in this booklet and the Fair as we all gradually put corona behind us. ■

Advancing innovative education

ETH Zurich has been promoting innovation in education for more than 20 years. Extensive use of blended learning, combining online and classroom teaching, has played a key role in tackling the covid crisis. Innovedum offers financial support for projects ranging from individual events to extensive reform of entire degree programmes. In addition, it acts as a forum to share thoughts and experiences on innovative approaches to education. The new Innovation in Learning and Teaching Fair, a large exhibition in the main hall, is an important component of this.

Innovedum = Innovation + Education

44 projects running currently

2 million

Swiss francs worth of funding provided every year to support initiatives that contribute to the development of quality education at ETH.

Computerised assessment of maths problems

Lecturers in the Department of Mathematics are building a collection of maths problems in the STACK form. This Moodle plug-in allows student answers to be assessed automatically. This saves time and allows more challenging questions to be asked that encourage more mathematical thinking.

Engaging Physics Tutoring Hub

During the remote teaching phase, teaching assistants in the Department of Physics created a forum to share teaching methods and swap materials for preparing exercises in introductory physics courses.

Examples of current projects

Autonomous, fun learning

In the "Academic Writing" course at the Department of Management, Technology, and Economics, students are free to choose from topics, study settings (groupwork, individual work, etc.) and presence modes (online or on campus). The interaction is entertaining as well: students can select a points system or receive credits in Moodle.

2020/2021

47 projects submitted
33 projects approved
7 on the topic of MOOC/Blended Learning
2 degree programme initiatives

Programme and floor plan

2022
INNOVATION IN LEARNING AND TEACHING FAIR

Wednesday, 4 May 2022

3–4.30 p.m.:
Exhibition: 44 innovative educational projects
in the main hall

5–6 p.m.:
Presentation KITE Award 2022
in Audimax (in English)

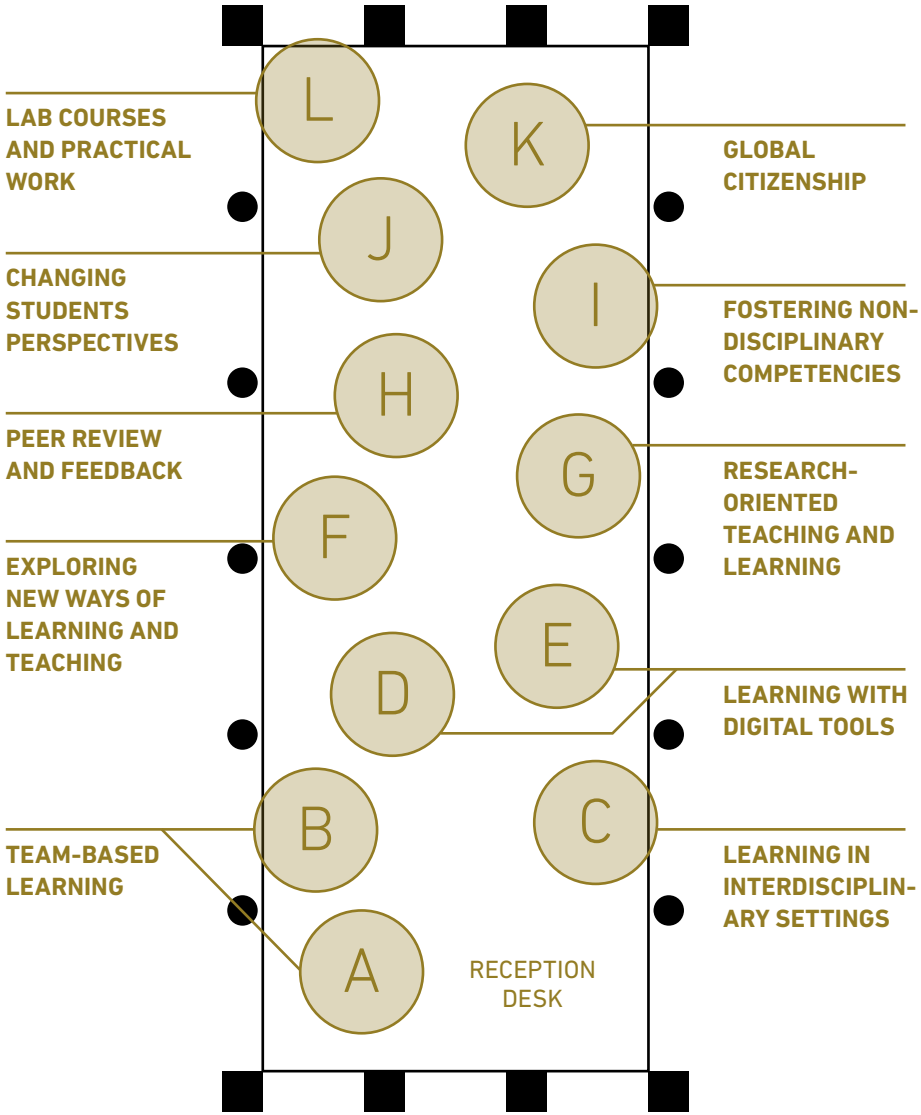
followed by a drinks reception

More information or already planned?

All projects of the fair will be described in detail on the web a few days before the event.

teachingfair.ethz.ch

POLYTERRASSE



RÄMISTRASSE

Stands and projects

TEAM-BASED LEARNING (A+B)

- **Genome Engineering**
  Prof. Dr. Randall Platt
- **One Study, Two Paths: The Dual-Use Dilemma in the Life Sciences**
  Dr. Michèle Gemünden, Dr. Oliver Thränert
- **Digital Health Project**
  Dr. Tobias Kowatsch
- **Strategies for Sustainable Business**
  Dr. Johannes Meuer
- **Imaging and Computing in Medicine**
  Dr. Caitlyn Collins

LEARNING IN INTERDISCIPLINARY SETTINGS (C)

- **Idea League Course**
  Dr. Tino Stankovic
- **CEMETS Virtual Institute**
  Dr. Katherine Marie Gahr, Prof. Dr. Ursula Renold
- **Agroecologists without Borders**
  Dr. Kenza Benabederrazik, Dr. Benjamin Wilde, Prof. Dr. Johan Six
- **Rain Forest Ecology**
  Dr. Chris Kettle, Dr. Fritz Kleinschroth, Prof. Dr. Jaboury Ghazoul

LEARNING WITH DIGITAL TOOLS (D+E)

- **Virtual Thermodynamics Lab and its use in Advanced Physical Chemistry**
  Anatol Aicher
- **Algorithms, Probability, and Computing**
  Dr. Manuel Wettstein
- **MOSFECCS**
  Prof. Dr. Carlo Thilgen
- **Differential Diagnostics**
  PD Dr. Christian Schmied, Christian Fässler
- **Videos und Apps für Analysis-Servicevorlesung Materials Redesigned BSc 2020**
  Dr. Andreas Steiger
- **Innovationsprozess**
  Dr. Quentin Lohmeyer
- **Production and Operations Management (FactoryVR + #POM4all)**
  Prof. Dr. Torbjørn Netland
- **STACK – an Online Assessment Tool Using Computer Algebra**
  Dr. Andreas Steiger, Dr. Meike Akveld

EXPLORING NEW WAYS OF LEARNING AND TEACHING (F)

- **Engaging Physics Tutoring Hub**
  Dr. Vira Bondar
- **Autonomous Gami ied Learning**
  Dr. Reka Mihalka
- **Learning Spaces in Pandemic Times**
  Prof. Momoyo Kai ima, Grégoire Farquet, Christoph Danuser, Simona Ferrari
- **From Flipped Classroom to Blended Learning**
  Prof. Dr. Andreas Vaterlaus, Dr. Guillaume Schiltz

RESEARCH-ORIENTED TEACHING AND LEARNING (G)

- **Online Information Fair: ETH Library – Your Partner for Managing the Research Life Cycle**
  Beatrice Krause, Eva Edinger

- **Graduate Collective**
  Dr. Caroline Welte
- **Developing an Interdisciplinary Research Idea**
  Elizabeth Amadei
- **Large "Problem Based Learning" Sessions – No Problem with Miro Boards!**
  Dr. Urs Brändle, Katrin Wolf, Samuel Wildhaber

PEER REVIEW AND FEEDBACK (H)

- **Bridging Art & Science**
  Shruti Patel
- **Excursions in the World Food System**
  Dr. Brigitte Dorn, Dr. Urs Brändle
- **Code Expert Meets PELE**
  Dr. Lukas Fässler, Dr. Markus Dahinden

FOSTERING NON-DISCIPLINARY COMPETENCIES (I)

- **MSc Pharmacy: Clinical Trainings**
  Prof. Dr. Andreas Gutzeit, Dr. Dominik Stämpfli, Irene Vogel Kahmann, Dr. Peter Wiedemeier
- **Psychiatrie & Computational Psychiatry**
  Prof. Dr. Klaas Enno Stephan, Dr. Helen Schmidt, Dr. Jakob Siemerkus
- **Hacking for Social Science**
  Dr. Matthias Bannert
- **Prisma**
  Deniz Yildiz

CHANGING STUDENTS PERSPECTIVES (J)

- **Teaching Ethics, Ethics Resource Platform**
  Joanna Sleigh
- **Was lernen und denken die Studierenden am Student Project House?**
  Dr. Lucie Rejman
- **Protect Us From What We Want**
  Berit Seidel, Helene Romakin
- **Lehre in Zeiten der Pandemie**
  Prof. Dr. Philip Ursprung

GLOBAL CITIZENSHIP (K)

- **Corporate Sustainability**
  Dr. Erik Jentges, Prof. Dr. Volker Hoffmann
- **The School of Architecture for Reconciliation**
  Dr. Jennifer Duyne Barenstein
- **International Development Engineering**
  Prof. Dr. Isabel Günther
- **Thermodynamics and Transport Phenomena in Nanotechnology**
  Prof. Dr. Thomas Schutzius

LAB COURSES AND PRACTICAL WORK (L)

- **Transformation of Hands-On Practical Courses to Virtual Labs During the Corona Pandemic**
  Dr. Katja Köhler, Prof. Dr. Markus Künzler, Dr. Matthias Gstaiger
- **Teaching Basic Experimental Skills Without a Lab**
  Dr. Andreas Eggenberger, Dr. Alexander Eichler, Dr. Max Doebeli, Prof. Dr. Adrian Biland, Dr. Martin Kroner, Dr. Marius Simon
- **Hands-on Quadcopter Education at all Levels**
  Dr. Paul N. Beuchat, Jeremy Coulson, Prof. Dr. John Lygeros
- **Mixed Reality for an Enhanced Lab Course on Microfluidics**
  Prof. Dr. Simone Schürle

KITE Award 2022

For the fourth time since 2016, ETH Zurich is presenting the KITE Award to honour particularly innovative teaching projects and initiatives that consolidate skills and have the potential to be applied to other subjects and fields. This year, the winning projects were developed during a period when distance learning produced some very creative teaching approaches.

The following three projects have reached the final. The winners of the KITE Award 2022 will be announced at the prize-giving ceremony at 5 p.m.

Prof. Dr. Torbjørn Netland, Katalin Tesch, Dr. Erik Jentges

Practising in the virtual factory

Video tutorials instead of lectures – and group tasks in the virtual factory: lecturers from the Department of Management, Technology, and Economics have designed an open-access introductory course for online study.

During the coronavirus pandemic, one online lecture followed another and students often spent the entire day on video calls. Their own rooms became lecture theatres, blurring the boundary between study and free time. Many students complained of physical exhaustion, emotional emptiness and monotony.

"We wanted to offer students a totally different online learning experience," says ETH Professor Torbjørn Netland. When the pandemic hit, his team collaborated on the development of a new online concept for the introductory course on Production and Operations Management (POM).

Video lecture replaces online lectures

What is Industry 4.0? What are the advantages of Toyota's production system? And what does just-in-time production mean? Over the course of 44 five- to ten-minute tutorials, Netland and his team set out to explain the most important concepts and principles in production management.

"Our goal was to produce informative, entertaining and lively videos that students enjoy watching," says Netland. To do so, his team recorded short lectures interlaced with questions, pop-up graphics, audiovisual elements and a good pinch of humour. The team had technical support from Katalin Tesch, a video producer at Netland's group.

Rather than recording a 90-minute lecture, Netland and his colleagues published three to five videos on Moodle every week, supplemented with texts to reinforce the material.

Every two weeks, the students met up live via Zoom to compete against each other in a quiz about the material presented in the videos. The winners received a packet of POM-bear crisps and an item of official ETH merchandise they could collect from Netland's office. During and after the quiz, Netland was on hand to answer questions personally and elaborate on any of the questions the students had difficulties with.

Virtual factory visit

The best way for anyone to understand how a production system works, is to visit one in person. Even under normal circumstances, it was tricky to organise a visit – and practically impossible during the pandemic. "So we decided to use virtual reality (VR) to bring the factory to the students," Netland explains. With the help of Innovedum funding for his "FactoryVR" project, his team produced the VR content by themselves. Using cheap VR goggles and a smartphone or computer, students can visit real factories operated by the company Hilti. They can take a virtual tour through the production halls and solve realistic production problems at different stations. They win points for doing so, just like a video game.

These experiences formed the basis for one of two marked group exercises. Here, the students worked in groups of four using VR to check how well businesses like Hilti implement the principles of Lean Management or how production could be organised more efficiently. They wrote up their findings in a graded report and presented their solutions in a flipped classroom design in weeks between quizzes. ■

Jeremy Coulson, Dr. Paul Beuchat, Prof. Dr. John Lygeros

Lab experiment takes off at home

Sitting alone in front of the computer at home, yet still discovering through teamwork how to fly a quadrocopter drone autonomously: this was the impressive achievement of students from the Department of Information Technology and Electrical Engineering, with the expert support of their supervisors.

In the course "Quad-Rotors: Control and Estimation", Bachelor's students of the Department of Information Technology and Electrical Engineering are able to deepen and apply their theoretical knowledge of control systems in the laboratory. Their task is to work in a small team on the development of their own control system that allows a tiny drone, or quadrocopter, to fly autonomously. In the lab, students can use a sophisticated motion capture system to carry out measurements of the drone's position and orientation.

The course had only been running for three years before lockdown hit. "Since the students couldn't visit the lab, we had to bring the lab to their homes," explain Jeremy Coulson and Paul Beuchat, who devised and ran the course. They quickly adapted the quadrocopter's hardware and used online teaching resources to allow remote teamwork and supervision.

"We sent students a package with a modified quadrocopter and plug-and-play software developed by us," says Jeremy Coulson. This gave them the hardware they needed to carry out experiments at home without the usual expensive laboratory equipment available before the pandemic. "At the same time, our goal was to create an atmosphere in which students are able to work together effectively in teams," Paul Beuchat adds. "In addition, we wanted to be able to give students just-in-time learning guidance." The break-out sessions available in Zoom were ideal for this purpose.

The feedback from students was overwhelmingly positive. Coulson and Beuchat therefore plan to continue making their hardware and software available to students in the future, so they can carry on working with quadrocopters outside teaching hours. ■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A FLYING OPEN DEVELOPMENT PLATFORM
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Dr. Andreas Eggenberger, Dr. Marius Simon, Prof. Dr. Adrian Biland,
Dr. Max Doebeli, Dr. Martin Kroner, Dr. Alexander Eichler

Physics experiments at home

Physics can also be taught remotely through experiments at home using cardboard, water bottles, sunglasses and smartphones. But the level of supervision and guidance required some unconventional approaches.

In March 2020, the 600 students of the physics lab course no longer had lamps, filters and measuring devices for their practical experiments, but just household objects: the university was forced to close its physics labs and it was impossible to buy non-essential items in shops during the initial lockdown.

Looking back, Andreas Eggenberger, Head of Physics Lab Experiments, actually sees this as a positive: "The situation has helped us push ahead more quickly with the restructuring of physics labs that was already under way, while also devising new experiments. And students became aware that a physical way of thinking and problem-solving is equally possible in an everyday environment."

Only a few days after the first lockdown on 16 March, Eggenberger and his colleagues had already reconfigured the course. They created experiments that could be safely performed at home, provided results that could be assessed, and provided equal didactical value.

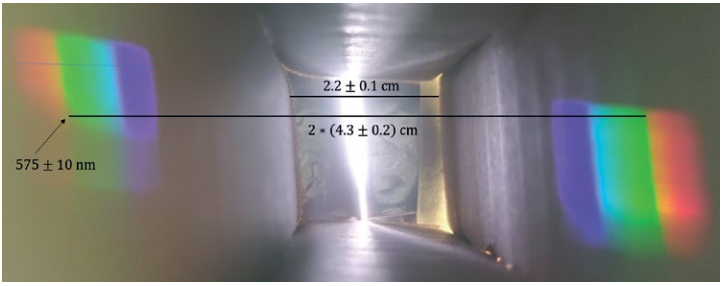
The students used water bottles, cardboard, CDs or polarised sunglasses to determine the speed of sound, constructed a visible-light spectrometer or verified Malus' law, which describes the intensity of light behind a polarisation filter. Instead of lab equipment, students used sensors present in every smartphone, along with basic household devices such as scales, thermometers or rulers.

The personal supervision required was almost even more challenging. Lecturers wrote detailed instructions and during the experiments, teaching assistants supervised up to eight students in parallel via Zoom. Students also had access to chats and forums for asynchronous support. Even so, these measures could not replace the level of interactive support available in the physics lab. Teaching assistants also found it very tricky to identify whether students had any problems or difficulties during the Zoom meetings.

"But there are also some positive sides to working on one's own," says Eggenberger. "By having to conduct their own experiments at home, students have to deal with more unknowns and have to be better at organising themselves. Both these skills are extremely valuable not just in research, but in industry as well."

Since Autumn Semester 2021, students are back on campus – and in the laboratories. The new "@home" experiments are still in the portfolio, however. A subsequent survey showed that more than three quarters of students would like to perform two or more experiments at home, even if the labs are still open on campus. ■

DIY spectrometer: incoming light is collimated (made parallel) through a slit consisting of two razor blades and spectrally split at the other end by a CD acting as a diffraction grating. Students can use the angle of diffraction to determine the wavelengths of light from various sources.



Learning together whenever possible
Lecture subject to protective measures

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