COVID-19 challenge: hands-on robotics teaching also works online

COVID-19 has helped online teaching make a breakthrough at many universities. But how do teachers cope with the pandemic in practice-oriented courses such as robotics, where working in the lab has been considered essential and indispensable until now? This is what two scientists at Jacobs University Bremen have been investigating. The work of Andreas Birk, Professor of Electrical Engineering and Computer Science, and psychologist Dora Simunovic was recently published in the "IEEE Robotics & Automation Magazine".

Just two years ago, it was almost unthinkable that lab work could be replaced by online teaching. “Touching equipment, trying it out, doing experiments together with students on site – the traditional classroom lab was, and to a large extent still is, the dogma,” Birk said. "It was considered a disaster that this was suddenly no longer possible in times of the pandemic. Alternatives were not even seen."

But that attitude has changed. During COVID-19, the vast majority of robotics instructors practiced online instruction with elements that replace the face-to-face lab experience, according to one study finding. And there is a strong expectation among faculty that this will continue. Simulation environments that students can use on their home computers emerged as the most important tool for hands-on instruction. "This type of knowledge transfer will become permanently established. This is what teachers around the world are assuming," says Birk.

Jacobs University researchers surveyed 96 international teachers between June and October 2020. During this time period most students’ performance improved. They achieved better grades than before the pandemic, even though they were unable to work in the lab on site. Whether these learning outcomes are actually due to better performance or milder grading remains an open question. "Many students find online learning convenient. They appreciate being able to learn at their own pace," said Birk, who teaches in the Robotics and Intelligent Systems program at Jacobs University, among others.

Despite the positive experiences with simulation environments, it remains a largely open question whether and how lab work can be implemented online. Birk considers remote access approaches to be promising. Students would then be able to use the labs outside of opening hours. These would be better utilized, and the flexibility of studies would increase. "Further research would be needed here," he said.

The survey, titled “Robotics Labs and Other Hands-On Teaching During COVID-19: Change is here to stay?” has been funded by the Jacobs Foundation as part of “B3 – Bildung Beyond Boundaries." Through this joint initiative, the foundation and Jacobs University promote radical, innovative ideas in higher education. In total, the Jacobs Foundation has supported nine research projects at Jacobs University with a total of 1.3 million euros.

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Studying in an international community. Obtaining a qualification to work on responsible tasks in a digitized and globalized society. Learning, researching and teaching across academic disciplines and countries. Strengthening people and markets with innovative solutions and advanced training programs. This is what Jacobs University Bremen stands
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