

# HOW COVID-19 CHANGED COMPUTER SCIENCE EDUCATION

The global pandemic has forced lecturers and academics to transform how computer science is taught. Discover how innovative technology and techniques are being used during lectures that can now reach an international audience.

The COVID-19 pandemic has affected both staff and students within higher education. The Advance Higher Education Academy (AHEA) has supported academics in enhancing their pedagogical practices throughout the pandemic, by offering the Postgraduate Certificate in Academic Practice (PGCAP or PGCert) teaching qualification. PGCAP helps academic staff to improve their teaching skills by reflecting on their teaching practice, evaluating their teaching methodology and considering enhancements to their current teaching approach.

Educators can also achieve the Fellowship of the Higher Education Academy (FHEA) via AHEA after successful completion of PGCAP.

## POST-COVID ERA

With the advent of the COVID-19 pandemic, teaching a module has become more difficult, especially online, with students scattered across various locations. One particularly challenging aspect of virtual learning is keeping students engaged. Therefore, the content of PGCAP must be adapted to face the challenges brought by the COVID-19 pandemic.

It is now more important than ever for PGCAP to support academics to teach students both face-to-face and online, using the latest tools and technologies. Here, we discuss

## "THE FLIPPED CLASSROOM MODEL HAS NOW BECOME COMMONPLACE DURING THE PANDEMIC."

how PGCAP helps new academics to improve their blended delivery.

The pandemic has given an opportunity for higher education establishments to reform their current teaching delivery and include both virtual learning and face-to-face teaching as a part of the curriculum. PGCAP encourages academics to adopt technology-oriented teaching techniques (e.g. gamification) to enhance the delivery of their modules via face-to-face and online mediums. Hence during the pandemic, pedagogy has been enhanced by the adoption of the following:

## ONLINE TEACHING PLATFORMS AND TOOLS

During this pandemic, online teaching platforms have played a crucial role, where content has been delivered using platforms such as Microsoft Teams, Zoom, Google Meet and Blackboard Collaborate. In addition, online quizzes (Kahoot or Mentimeter) have also played a key role and have been used at different stages of an online session:

- **Start of a session:** to test the prior knowledge of the students and reinforce content from previous sessions.

- **During the session:** to test active learning of the students.
- **End of the session:** to assess the learning of the students after the delivery of the entire content.

On the other hand, relying on too many unnecessary Mentimeter quizzes can lead to students losing interest. Hence, this should be used with care. Online teaching platforms also facilitated lab exercises and coursework (e.g. coding-based group projects). For group projects, this enabled students to interact and engage with each other while making teams, despite being in various geographical locations. Virtual learning environment (VLE) tools such as Moodle can be used to perform this function.

Various drop-in sessions were also scheduled to replace on-campus tutorials to solve students' queries; this gave an opportunity for introverted students to ask questions, typing via the chat facilities available within online platforms. The interaction was instant for both the students and the teaching team but required meticulous planning to facilitate this for classes with over 200 students. Solving students' problems fast helps their confidence as well as improving the satisfaction rate of the teaching module.



## DURING THE PANDEMIC, IT WAS PARAMOUNT TO REDESIGN CURRICULA TO FACILITATE ONLINE AND FACE-TO-FACE TEACHING.

### NEW METHODOLOGY

The flipped classroom model has now become commonplace during the pandemic. It has allowed teachers to utilise various resources to improve their teaching practice, such as Kahoot or Mentimeter based quizzes, short videos or podcasts to introduce a topic, animated PowerPoint presentations, and demonstrating concepts using various online games — to name a few.

Below are some examples of good practice:

- **Interaction and engagement.** Using interactive videos via H5P helped to measure students' levels of engagement with the teaching content. Furthermore, it was used as a formative assessment, to identify the learning needs of students. Teachers could then adjust the pedagogic approach to help students better understand the content.
- **Lecture recording.** Most teachers recorded their live sessions and uploaded them on the media servers of their universities, which helped students who were attending the module from various locations with different time zones. Despite being affected by the pandemic, lecture recordings helped students to follow the material through the recorded lectures at a later stage.
- **Remote project deployment.** Students are involved in a variety of mini-project assessments that require them to deploy their outputs using a dedicated platform. Virtual learning platforms have been used more extensively, as students have been working on their projects remotely. One such example is the use of the OpenShift container



Image source: Adobe stock

platform, on which students deploy their projects, making it easily accessible for remote assessment.

- **Lab interaction.** Lab sessions were facilitated using Microsoft Teams and online Google/Microsoft forms, to enable interaction between students and demonstrators. Forms were used by students to get support from demonstrators and to request evaluation of their assessments. Furthermore, in the assessment of lab work, quizzes were also used to measure the progress of the students — both in terms of summative and formative assessments. Demonstrators can now record the videos of every lab demonstration and upload them to the media portal prior to the session, which saves time and reduces student queries during the lab session.

### CURRICULUM DEVELOPMENT

During the pandemic, it was paramount to redesign curricula to facilitate virtual learning and face-to-face teaching. The curricula were redesigned in such a way that it also fulfilled all the intended learning outcomes (ILOs) of modules given a 'flipped' classroom approach.

### CHALLENGES AHEAD

Various techniques have been successfully used and implemented throughout the pandemic. Still, various challenges remain:

- **Hardware based practicals.** Some project work requires access to physical infrastructure

or hardware labs to complete coursework or capstone projects (e.g. final year projects based on embedded systems) and both students and tutors need to go to campus for these practicals.

- **Ability to focus online.** Ensuring and monitoring student engagement during live sessions has been a challenge during the pandemic. Indeed, it is very difficult to spot how engaged students are without the direct (physical) observation of the students.
- **Attitude.** The implementation of online teaching is more difficult if students and teachers believe that face-to-face teaching is more productive. For example, some subjects in engineering require face-to-face teaching for effective delivery.
- **Misconduct.** Finally, preventing cheating during summative assessment is difficult because students take exams from remote locations.

We hope that this article will help higher education teachers to improve their teaching practice.

### ABOUT THE AUTHORS

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