Online practicals: why, what and how?

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Centre of Expertise for Higher Education *(University of Antwerp)*

The coronavirus pandemic forced us to switch to a different way of teaching. In the process, we learned a lot about online education. We want to take this new knowledge with us into the future, as we focus more on ***blended learning****. UAntwerp members of staff can consult the* ***vision statement*** *titled 'Blended learning: Education at UAntwerp as of 2021-2022', as approved by the Education Board, on Pintra (after logging in).*

In the previous ECHO Teaching Tips, we already discussed some topics related to online and/or blended education. In this tip, we will expand on this and give you some pointers to help you organise **practicals and skills education online**. We will share **examples** to inspire you, as well as practical **tips**.

Why organise practicals online?

Students are expected to be able to carry out certain parts of practicals **on their own**. This creates more time and space to discuss and get help with more challenging aspects during lessons.

Examples of (parts of) practicals that students can work on independently include: practising simple basic operations, drawing up a pipetting scheme, distilling lab results into a report, and studying procedures.

When an online approach to a practical is implemented properly, it can have a **positive effect** on students (Jackson, 2020; Jackson et al., 2020; Şentürk, 2021):

- **transfer** of newly learned competences to other contexts

Students not only get to work on new competences on campus, but also online. This means they have to apply competences from face-to-face classes in a different context, which we call 'transfer'. Since the transfer to the online context has already taken place, students will also be better able to apply these competences in other contexts still, such as the workplace.

- development of **self-regulation skills**

By self-regulation, we mean the ability to control and adapt one's own thoughts, emotions and behaviour. This requires various skills such as planning, doing goal-oriented work, having insight into one's own abilities, dealing with feedback, being able to motivate oneself, etc. These are skills that students increasingly need to take control of their own learning process. Since an online approach to practicals requires a higher degree of independence from students, it encourages them to work on such skills.

- **learning efficiency**

As mentioned before, students develop various self-regulation skills by working on practicals independently. As they train these skills, students can better regulate their own learning process, which will ultimately increase their learning efficiency.

- **motivation** to process the learning content

Students' motivation increases when they realise that they can process (parts of) the learning content at their own pace. Adding certain motivational strategies can also have an effect on this (see below).

- **peace of mind** and **satisfaction**

Online practicals usually allow students to work at their own pace and in their own environment, so they have a greater sense of being in control, which often increases their peace of mind and satisfaction.

The Social Work students of Jackson et al. (2020), for example, practised conducting interviews at home or

in another quiet environment, and sent video recordings to their lecturer. As a result, the students experienced less pressure.

In general, it is argued that an online approach can have a positive effect on the **academic performance** of students, also in the longer term (Jackson, 2020; Jackson et al., 2020; Şentürk, 2021).

How to organise online practicals?

During practicals, students acquire and/or practise certain techniques, skills or procedures independently – either individually or in groups. They do this under supervision and with the necessary guidance. This ECHO Teaching Tip (2012) (in Dutch) discusses how to set up practicals. Let us review **four important tips** and focus on some additional points of attention for online variants.

1. **Make sure that the practical is properly prepared.**

   - Start preparing your online practicals well in advance. After all, things like recording a video for the first time and learning to work with a new online tool can be time-consuming. Be sure to test the online parts yourself beforehand and/or have them tested by a colleague.

   - Check which (parts of the) learning outcomes for your practical can be achieved online. Ask yourself the following questions when considering this: What materials are needed and do students have access to them at home? What is the degree of difficulty of the assignments for this specific group of students? What guidance is needed, and can it be provided online?

   - Choose an approach that suits you and your students. Find out for yourself what you feel comfortable with and/or to what extent you want to challenge yourself by choosing a new teaching method. In addition, take into account the characteristics of your students (e.g. their degree of independence, prior knowledge, motivation).

   - Your online education does not have to be a faithful 'word-for-word' translation of your face-to-face education. Try to look at the digitalisation of your education through a different lens.

   - If necessary, enlist the help of an educational support worker. And do not be afraid to have a look at how your colleagues are organising their online practicals.

2. **Make your expectations clear from the start.**

   - Good communication with students is just as important in an online setting. Make sure it is clear what your expectations are, when and how students should submit something, which parts will take place online and which online tools will be used.

3. **Provide guidance.**

   - Tell students who can help them with questions about the online nature of the practical, or with computer problems. If you use new online tools, provide a short manual or demo for students. As you go digital, make sure that no student is left behind.

   - Keep paying sufficient attention to contact, connection and interaction. There are many online possibilities and tools to provide this, such as a discussion forum or an open space in Blackboard Collaborate Ultra, where students can work together freely.

4. **Give feedback during or right after the practical.**

   - In on-campus practicals, you can observe the students live. In online practicals, there are other ways to gain insight into your students' work: you can arrange video calls or have the students submit videos or photos (see below). You can also test your students' knowledge with an online quiz or assignment, for example. Whichever method you choose, make sure that the students get the necessary formative feedback: what is going well, what can/should be improved, and how can this be done?

Examples of different forms of online practicals

Inspired by Rubens (2020)

- **Online learning**

Some skills and competences can be practised by students **entirely online**. In addition, digital skills are becoming increasingly important. It is important to impart these skills to our students so they can function in today's society.

For the '21st-Century Skills' classes taught by Şentürk (2021) in a teacher training programme, students had to create and share their own digital learning materials. A skill that the students developed entirely online.

There are numerous **online applications** out there that students can use to support their learning, while also receiving immediate feedback.

For example, when learning to give a presentation in a foreign language, students can use Microsoft PowerPoint's speech recognition feature to check whether their pronunciation is correct and clear.

Online education offers additional opportunities in the area of **internationalisation**. Physical travel is no longer necessary to connect with other students, lecturers, employers and other people all over the world. There are plenty of opportunities to reach out to people online. This way, all students can gain international experience and work on their intercultural competences.

Wilma van den Berg and Tom Schoemaker talked to SURF (in Dutch) about their project, 'Re-thinking education in an international context'. Teacher-training students from four different countries (Chile, the US, China and the Netherlands) discussed their respective countries' education systems via a live online connection. This resulted in valuable interactions and interesting international contacts (Kips, 2020).

Several students of Theatre, Film and Literature Studies (UAntwerp) took part in a COIL project (Collaborative Online International Learning), working on group assignments together with students in Singapore.

Finally, students can use **just-in-time information** online, which allows for more differentiated teaching. Just-in-time information refers to providing all the information that students might need throughout their learning process, with the students choosing when/whether they use this information. They can work independently and use the extra information just-in-time, i.e. as needed, if they feel they could use it as an additional resource then and there.

Jackson (2020) used 'hint-or-try' assignments in his online module to prepare students for a lifeguard training course. The students had to react to an authentic scenario and were asked to try and come up with the correct answer on their own. If necessary, they could get additional information in the form of a hint.

- **Video learning**

You can make a video recording **of yourself** as you perform a lab test or another practical skill. Students can then watch this recording in preparation for a practical to familiarise themselves with the setting (e.g. the materials or equipment used, the test set-up, etc.) and the tasks to be performed. You can combine this with a few content-related questions or a short quiz to test their prior knowledge. If you cannot record a video, photographs are a good alternative.

Because of the mandatory lockdowns in 2020, An Langbeen of the Bachelor of Veterinary Medicine (UAntwerp) switched to an online version of the Skills lab (in Dutch). She used various camera set-ups during the live/online practicals (cameras attached to the ceiling, to the lecturer's forehead and to the laptop) to show the tasks that had to be performed from different angles. Students prepared for the practicals by watching videos and practising at home with the help of a DIY kit that they had collected beforehand. The lecturer also provided tips on which materials they could use as an alternative. At agreed times, the lecturer made video calls to the students to watch them perform the tasks live.

Now that students can attend class on campus again, these videos are no longer used. As this approach

offered little to no interaction between students, they were unable to learn from one another. This, according to An Langbeen, was a major disadvantage. However, she did retain one aspect of this remote learning approach. She reworked several assignments so that the students could carry them out independently at home. This way, they were able to complete the assignments better than before, so they came to class more prepared.

You can also ask your **students** to record a short video of them demonstrating their practical skills. Again, photographs are a good alternative if they cannot record a video. This can give you valuable insight into the skill level of your students.

Bachmann et al. (2020) demonstrated procedures for suturing wounds live, on campus, to medical students in their third bachelor year. These students then practised the procedures at home and uploaded a video to the online learning environment. An annotation tool (such as Blackboard Annotate) enabled other students and lecturers to add text comments to selected parts of the videos, which served as a means of support and feedback.

- **Serious gaming**

Serious gaming refers to the integration of certain gaming mechanisms into teaching and learning activities. Specifically, this often involves the use of **motivation strategies**, like action points that students can earn, or different levels that have to be completed.

At UAntwerp, 'Quality in Pharmacy' is a pharmacy game (in Dutch) that has been part of the Magistral Preparations and Quality Assurance practical since 2008, to help students prepare for the internship in the Pharmacy and Drug Development master programmes. For this game, students are divided into small groups and tasked with running a virtual pharmacy by responding to realistic cases. Each group's pharmacy can win or lose clients, depending on the solutions they offer to treat these cases. This format has three major advantages. First of all, the assignments are very authentic, so there is a significant connection to the real world. In addition, this game challenges the students, and the element of competition provides extra motivation. Finally, the students automatically receive instant feedback, which speeds up their learning process.

- **Taking things one step further: online simulations, digital twins, and virtual reality (VR)**

The development of simulations, digital twins and VR applications is usually very expensive and time-consuming, depending on the nature of the application. Nevertheless, we wanted to include a brief mention of these applications here, as they offer many possibilities and, in the future, they are likely to find their way into higher education.

In an **online simulation**, the student has to react to an authentic scenario. The online simulation then shows a realistic reaction to the student's behaviour.

A well-known simulation in the Netherlands, for students who will go on to work in health care, is abcdeSIM. Students have to give first aid to a virtual patient who responds to every action they choose to do. This teaches students to apply the widely used ABCDE method, and to treat life-threatening injuries first and non-life-threatening injuries second.

A **digital twin** is a digital copy of a real object. The copy is connected to the object, so they both exist in the same state. A digital twin can be used in two ways. The digital twin can be manipulated, and predictions can be made about the reaction of the real object. But the flow of information can be in both directions, so that manipulations of the digital twin also lead to changes in the real object (Fuller et al., 2020).

During the coronavirus pandemic, lecturers Amedee Beylemans and Bert Pauwels (Bachelor of Electromechanics, AP University of Applied Sciences and Arts) used a digital twin (in Dutch) for their applied process technology labs. Students logged on to the mini-skids and mini-plant, the installations on campus, remotely. First, they performed a try-out on just the digital twin, as a simulation, and then they also remotely controlled the actual installation.

Virtual Reality immerses the user in a virtual world by means of special goggles, headphones and controllers. In education, VR is often made more

accessible by only using the visual aspect, for instance by placing a smartphone in a special cardboard holder to create makeshift VR goggles.

Anneke Vuuregge (Bachelor of Pharmaceutical Sciences, Vrije Universiteit Amsterdam) talked to SURF (in Dutch) about the tool 'MolTour'. Her students need to acquire a lot of knowledge about cell biology and molecular biology, and this requires a thorough understanding of different molecules and cell processes. Ordinary two-dimensional images do not give enough insight into this, so students now use MolTour. This online tool is a 3D viewer with VR capabilities that allows students to study molecules, proteins, DNA and cell membranes in a very realistic way. The programme component is structured around an online course with video lectures and exercises using MolTour. Face-to-face lectures are held every other week, during which further applications are made based on the tool (Kips, 2020).

These three applications have two major benefits in common. Not only can students make mistakes and experiment without this having any real-world consequences, but (in part because of this) they can also access potentially hazardous or dangerous situations and unique places or objects.

A blended approach

When organising face-to-face practicals on campus, you can also opt for a blended approach. You can have students **prepare** for practicals and/or **process** them online. Blended learning is usually defined as the best of both worlds, combining the flexibility of an online course with the benefits of on-campus education. This means you can still reap the benefits of certain elements of an online practical.

If you want to organise a blended practical, there are several possibilities. One option is to take a **flipped classroom** approach, with students preparing the practical online. This allows them to hit the ground running during the actual on-campus practical. This ECHO Teaching Tip (2019) sheds more light on this teaching method.

In the Bachelor of Biochemistry and Biotechnology programme (UAntwerp), the flipped classroom method helps students prepare for the biostatistics practicals (in Dutch). Prior to the actual classes, and at their own pace, students watch knowledge clips to repeat the theory, as well as demos showing them how to use the statistical software. This frees up much more time during lessons to do exercises and to address more specific, in-depth questions.

The following video demonstrates the blended approach in the Anatomy & Radiological Anatomy (in Dutch) programme component in the first bachelor year of Medicine at UAntwerp. In order to deliver the learning content as efficiently as possible, online lectures are alternated with on-campus feedback moments. The students follow several e-learning paths on Blackboard and take a self-test after each one. On the forum, students can ask questions and lecturers can answer them. In addition, students can receive feedback on campus during work sessions, practical exercises and demo sessions.

You can also approach blended practicals the other way round, with students first acquiring knowledge on campus, and then deepening it online. This way, students can process new information or automate certain actions at their own pace **after the practical**.

In his '21st-Century Skills' classes in a teacher training programme, Şentürk (2021) used a virtual classroom environment where students could further process the content of the live classes. He also used a discussion forum where students could ask each other questions and share additional material. In addition, he had students compose wiki pages about the lesson content. This ECHO Teaching Tip (2021) contains more information on working with a wiki.

Of course, the **combination** of both is also possible, with students working independently online both before the on-campus practical and afterwards. This way, you can spend more time guiding and supervising your students.

Richard de Boer talked to SURF (in Dutch) about LabBuddy, an online tool used by Biomedical Sciences and Psychobiology bachelor students at the University of Amsterdam. With the help of this tool, he had the students make all the necessary preparations for a lab online. The tool allowed students to brush up on theory, to prepare research proposals and to draw up pipetting schemes. The actual research then took place in the lab on campus. Afterwards, students composed

their research reports online, again with the help of LabBuddy (Kips, 2020; Rubens, 2020).

We have shown that the online organisation of practicals and skills education has several advantages, illustrating with several examples that there are many possibilities. For more inspiration on this theme, please check out the resources below.

Want to know more?

ECHO Teaching Tips (in Dutch)

- Inrichten van practica (2012)

ECHO Teaching Tips (in English)

- An overview of ECHO Teaching Tips about blended and online learning
- Flipped classroom (2019)
- Online collaboration: what's a wiki? (2021)

Accessible only to UAntwerp staff members (after logging in)

- On campus and online: Inspiration and support page with information about UAntwerp's take on blended learning, which aspects you should take into account when designing your education, and which supporting tools and infrastructure are available at UAntwerp.
- Good practices (in Dutch):
  - Virtueel practicum bij diergeneeskunde + interview met An Langbeen + video An Langbeen (AUHU lunchsessie)
  - Apotheekgame als alternatief voor practicum
  - Digitale practica in de bacheloropleiding elektromechanica + video Amedee Beylemans en Bert Pauwels, AP Hogeschool (AUHA lunchsessie)
  - Flipped classroom d.m.v. kennisclips voor biostatistiek
  - Good practice: Onderwijsaanpak anatomie en radiologische anatomie (uantwerpen.be)
  - Blended leren: Flipped classroom design voor een praktijkgericht opleidingsonderdeel in 1e bachelor
  - Kennisclips als feedback bij practicumverslagen
  - Online zelftoetsen voor practica - experimentele fysica 1
  - Good practice: Blended leren Kinesitherapie bij kinderen
- Good practices (in English):
  - COIL Project between UAntwerp and LaSalle College of the Arts | Research Centre for Visual Poetics | University of Antwerp (uantwerpen.be)

SURF: Series of inspiring examples of online skills education (in COVID-19 times) (in Dutch)

- Anneke Vuuregge en Ton Blaazer (Vrije Universiteit Amsterdam) over blended practicumonderwijs met MolTour (Kips, 2020)
- Richard de Boer (Universiteit van Amsterdam) over online practicumonderwijs met LabBuddy (Kips, 2020)
- Wilma van den Berg en Tom Schoemaker (HAN Pabo) over internationalisering (Kips, 2020)

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