

**Keynote: Digitalisation in Higher Forestry Education - From Wishful
Thinking to a Normality with Further Wishes**

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PRE-PRINT

from the Proceedings of the SILVA Network Annual Conference
(digital)

**Digitalization in Higher Forestry Education –
Teaching and Learning Revisited**

held at the Department of Forest Sciences,

Technische Universität Dresden

July 7th – 8th, 2021

This publication has been peer-reviewed.

Please cite as: Michalek, C.R., 2023: Keynote: Digitalisation in higher forestry education - from wishful thinking to a normality with further wishes. In: Schmidt, P., Lewark, S. and Weber, N., (Eds.): Digitalization in higher forestry education – teaching and learning revisited. SILVA Publications 18, Dresden.

Pre-publication published online at [hyyps://ica-silva.eu/](https://ica-silva.eu/).



SILVA Publications 18, 2023

Editors: P. Schmidt, S. Lewark, N. Weber

KEYNOTE: DIGITALISATION IN HIGHER FORESTRY EDUCATION – FROM WISHFUL THINKING TO A NORMALITY WITH FURTHER WISHES

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Abstract

Using examples from the forestry programme and related fields of study at the University of Natural Resources and Life Sciences, Vienna (BOKU), it is demonstrated that there are a number of successful digital teaching scenarios with a desirable sustainable effect, not only since the COVID-19 pandemic, but reinforced by it. These include online lectures with recording, but also active learning, interaction and participation, as well as practical exercises and virtual field trips. It is shown that some of these transformations could have a lasting effect, such as flipped classroom or hybrid teaching. An outlook into future possibilities offered by immersive learning, virtual reality or augmented reality completes the picture. Despite this great potential of digital teaching, personal contact between teachers and students will continue to be important.

Keywords: digitalisation, higher education, forestry education, teaching, e-learning, blended learning

Introduction

The desire for digitalisation in forestry education has existed for a long time and there were already various approaches before the COVID-19 pandemic, but the pandemic was a real game changer. The fact that everything had to be shifted to online formats overnight, effectively made it a catalyst and a perfect excuse to do things differently or not at all. Teachers and students alike quickly recognised the advantages of solely online teaching, but also its limitations. Out of necessity, the adaptation of already existing but hitherto hardly accepted technologies such as videoconferencing or course recording took place in a very short time. It is to be hoped that they will become permanent features and thus a normality of forestry education, so that the way is open for new wishes, which will start the process all over again.

At this very special moment, a caesura as one might say, this keynote of the conference focuses on two aspects: firstly, the sudden challenges and the solutions that have emerged, and secondly, the transformations that have accompanied them and what might remain of them.

Sudden challenges that demanded quick solutions

Forestry is an important educational focus at the University of Natural Resources and Life Sciences, Vienna (BOKU), and is one of the founding degree programmes, however the COVID-19 pandemic hit it just as fast and hard as the other educational programmes offered. Therefore, forestry education cannot be addressed in isolation, but special consideration has been given to it when selecting examples.

After three semesters, in summer of 2021, some conditions have already become normal that seemed unthinkable before. For example, in a recent information session, one of the teachers stated in reference to the uncertainties of the coming winter term 2021 that the switch from face-to-face to online teaching would be easier than the other way around. This is a remarkable statement from teachers who until recently did almost only face-to-face teaching. A lot has changed in a relatively short time.

What were those sudden challenges? Most of them should be more than familiar to teachers at other universities from their own experience. First of all, the lectures had to be held online, which was fairly easy, assuming of course that a suitable videoconferencing solution was available. As an interesting side show, something that never really got off the ground was revived: the recording of lectures! But, it became more difficult not to lose the students at home, especially in large courses. So how could they be activated and how could interaction and participation take place? Here, too, the teachers relied on existing concepts and adapted them only slightly, such as the concept of flipped classroom, whereby the joint phase of applying what had previously been learned in self-study took place online instead of in the lecture hall. And then it became even more difficult: how can practical things like exercises be implemented remotely, or as virtual excursions? Great creativity was required to offer experiences similar to those in the forest or laboratory and to demand adequate substitute contributions. The important finale were the examinations, which had to fulfil all legal requirements. In summary, it can be stated that in addition to technical assistance, didactic interventions were especially necessary to find answers to these questions!

These didactic interventions on the part of the Division of E-Learning and Didactics comprised the following:

- Didactic course concepts had to be revised, often in the form of individual coaching of the teachers, with a special focus on the constructive alignment, i.e. the alignment of teaching and learning methods as well as forms of examination with the intended learning outcomes (Biggs, 1996).
- Numerous instructions and manuals for teachers were created or updated.
- A networking platform for teachers, the "BOKU E-Learning & Didactics Couch", was realised as a course in the learning management system, which is based on Moodle. In principle, this is an integrated performance support

system (Winslow and Caldwell, 1992) that is available around the clock and provides meaningful information at the moment it is needed.

- A special further training programme for student assistants was created to equip them with a good basis in didactic and technical skills.
- The e-multipliers programme was created as a mobile task force of the Division of E-Learning and Didactics. Like the tutors, they are student employees, but their training is even more extensive so that they can support the lecturers in the implementation of digital teaching concepts, in video production and post-editing, in the implementation of online examinations and in proctoring.
- The existing teacher training programme has been adapted and expanded and specialised training units for individual disciplines were developed.

Examples of successful teaching scenarios with a desirable lasting effect

In the following, a few courses, the didactic considerations regarding these and implementations are presented.

Online lectures with or without recording

The simple transformation of classic one-way lectures was primarily a technical challenge: the necessary hardware such as camera and headset were mostly available or could be obtained at short notice, the software in the form of the web-based open-source video conferencing solution BigBlueButton (BigBlueButton Developers, 2021) has already been integrated into the learning platform for several years; in addition, a campus license for the commercial solution Zoom (Zoom Video Communication, 2021) was acquired. Just delivering PowerPoint slides online with little interaction did not need much change in teaching. Nevertheless, it is positive that the number of lecture recordings has increased as a result. For more than ten years, BOKU has been providing full-service lecture recording for teachers. But it wasn't until the pandemic and videoconferencing it enforced, that it became more popular among teachers. What is interesting is that a change has taken place: It used to be offered by the institution, now either the teachers do it themselves or the students make unauthorized recordings, for example with the open source software OBS Studio (OBS Studio Contributors, 2021). There are still pitfalls, e.g. in relation to copyright, and Open Educational Resources are considered a solution to this.

Active learning, interaction and participation

To consolidate knowledge, students must be encouraged to apply what they have learned directly, preferably in practical contexts. Teachers need to provide space for reflection (Entner *et al.*, 2021). In synchronous environments, audience response systems are being used online in a way similar to how they have been applied in the auditorium in the past. Even easier than in the lecture hall, students can be divided into groups in breakout sessions so that they can discuss what they have learned. In

asynchronous settings, other methods were adopted, such as adding self-tests to the theory units or combining the revision questions with short videos.

Gamification elements, such as challenges, can offer additional potential, but have not yet been used much. For example, time-limited tasks may offer extra points and thus additional incentives to actively engage with the material. As an alternative to extra points, teachers have been awarding students virtual badges for special achievements for some time now, which are displayed directly in the learning platform for a certain period of time.

The flipped classroom method, which has also been practiced for many years and in which the content is no longer presented in class, but is prepared by the students at home and the time spent together is used for discussion, also received a digital transformation. For example, in the course “Dendrology” there is a voluntary introductory unit via video-conference. Students work through the content on their own using short videos of 10 minutes and then have to complete a quiz to unlock the next video. This is supplemented by online question and answer sessions every one or two weeks.

Practical exercises and virtual field trips

Practical exercises are probably the most difficult to do purely online. In the example "Forest Biometrics I", this is still relatively easy, because the lecture with exercises takes place on the computer with the statistical software R. The teacher's screen is shared and recorded in the video conference. Quizzes are used as homework, with the exercise information for the individual students randomly selected from a pool of questions and therefore different. However, the associated exercise took place quite conventionally in the teaching forest under safety precautions in both, 2020 and 2021.

Interactive courses are also not new, but have always involved a great deal of technical effort and time. With so-called authoring software, such as iSpring Suite or Storyline 360, interactive, complex quiz scenarios can be developed based on Microsoft PowerPoint slides (iSpring Solutions, 2022; Articulate, 2022; Microsoft, 2022). These can then be integrated into the Moodle learning management system with the help of the e-learning exchange format SCORM, which stands for Shareable Content Object Reference Model (Moodle Community, 2022). Such interactive slideshows are used, e.g., in the Master programme "Environmental Sciences – Soil, Water, Biodiversity (ENVEURO)". In the course "Soil and terroir in viticulture and oenology", students are guided step by step through the soil water balance test and receive immediate feedback and not just at the very end.

There are some good implementations of virtual excursions at BOKU, such as the course "Soil science and geology". The excursion lasts about as long as the face-to-face course. All participants take part at the same time, but access it from different locations. There is a common start and end via the video-conferencing platform Zoom, but in between the seven excursion sites can be visited at the students' own pace. Each

site is presented in a short film of about 20 minutes. A course in the learning management system Moodle serves as the platform, which links to the video sessions, provides the clips and in which the discussions take place in the forums.

Another example comes from the field of agriculture, but can easily be transferred to forestry education. Whereas in the previous case the videos were provided by the teachers, in the course “Organic farming excursion” they are produced by the students themselves. Since a joint excursion was not possible, the students visited different farms on their own and documented their interviews with the farmers on video. On the one hand, the aim was to present as many agricultural enterprises as possible; on the other hand, it was a declared goal of the teachers to explore the potential of video documentation. For this purpose, an interview guide had to be prepared beforehand. Again, the videos were made available to the other students in an e-learning course.

Online examinations

Very early in the pandemic, the Dean of Studies issued regulations regarding electronic examinations so that they would be legally secure. However, in a few cases there were appeals and some exams had to be cancelled and repeated. Online exams are technically complex and there are some pitfalls to avoid. That's why the Division of E-Learning and Didactics also provided teachers with a manual at a very early stage. In addition, many hours of individual coaching were offered by this unit, especially in didactic matters. Teachers were informed by the Rectorate of some possibilities: Assignments, oral or written online exams, open-book tests, but also portfolios, posters, essays, learning diaries, forum and blog posts. In open-book exams, sometimes also called open-note exams, students can use books and notes, but time is the limiting factor. The questions are also set in such a way that students must not only reproduce the knowledge, but also apply it. Teachers are free to choose but must announce the method to the students in advance. The proctoring of students to prevent them from using unauthorized aids is done by specially trained staff, the e-multipliers, and not by proctoring software. The reasons for this were data protection concerns, technical immaturity of the products and the very high licensing costs.

Transformations with lasting impact

What will remain of these changes?

Students' expectations have certainly changed: it is almost taken for granted that for every course there is an accompanying e-learning course in the learning management system that at least provides the necessary materials. If possible, this should also offer all other amenities such as links to live streaming and recordings of past events. This expectation increases the pressure on lecturers. In general, however, most teachers are in favour of a good blend of face-to-face and online elements, to varying degrees.

According to a study by Berghoff *et al.* (2021) only 18 % of teachers in Germany would like to see a return to pure frontal teaching, but it has its justification and will remain. Furthermore, only 2 % prefer pure online teaching. The majority favours face-

to-face enriched with online elements, blended learning (i.e. flipped classroom) and hybrid teaching.

And what happens next?

Flipped Classroom was not a new method, but will remain. It allows to use the valuable classroom time more meaningfully.

In the terms, when the vaccination rate will be already well advanced but not all students and or teachers can be back on campus yet, hybrid teaching could be a solution. It is a mixture of distance learning and on-campus activities. However, lecturers are quickly overburdened when they have to simultaneously teach in the lecture hall, broadcast the unit via video conference, solve technical problems and also answer questions from the audience on site and at a distance.

HyFlex is even a step up! All teaching units are offered in three formats: 1. as a face-to-face course, 2. synchronously online and 3. asynchronously online, e.g. as a recording. All three forms should be equivalent and students should be able to achieve the learning outcomes with them. This is didactically and technically very demanding!

Until now, online teaching has also been a grey area as it is not clearly regulated how the virtually delivered teaching performance is assessed as fulfilled. The old model, which counts pure attendance time in the lecture hall in the form of weekly hours, does not go far enough here.

What are still unresolved problems from the pre-pandemic period?

The pandemic did not accelerate the use and especially the production of Open Educational Resources. There are still a few loose ends to tie up and at least in Austria there are efforts on a national level. Teachers have been aware of the problem of copyright infringement for many years, but the step of creating their own materials, sharing them with others and using others to do so is still too large. The approach at BOKU is now to create the materials together with the teachers instead of taking away their materials. For this purpose, student assistants are provided by the university management supervised by the Division of E-Learning and Didactics.

In Austria, the University Act was reformed in 2021. The amendments improved for example, the legal situation for online examinations (Hochschulgesetz 2005 § 42b, Universitätsgesetz 2002 § 76a). The Web Accessibility Act (Web-Zugänglichkeits-Gesetz 2019), which in turn implements an EU directive (Directive 2016/2102), has been in force since 2019 but somewhat delayed by transition periods. This requires public bodies to make their websites, but also mobile applications, barrier-free and thus make them more accessible, especially for people with disabilities. In general, however, improvements in accessibility are beneficial to all users.

Another current topic is how students can be accompanied in their learning process in the best possible way, and a great hope is that the many student data can be evaluated, interpreted and the results made available to them. In addition to the positive aspects, this exciting topic of learning analytics naturally also brings with it some limitations such as data protection and security.

Students need personalised feedback for their learning success and want individual support and learning recommendations. A technical solution could be chatbots as a support system, i.e. a software that talks to students text-based and gives answers while behaving like a human being. The principle has been around for a very long time and depends heavily on the training of the software.

Are there any further wishes?

In order to make the digital learning experience even more intensive and effective, there are numerous approaches such as immersive learning, virtual reality or augmented reality, the latter is already being tested at BOKU in a course with the software Areeka Studio (Amlogy GmbH, 2022). Students move through the three-dimensional world by means of avatars that can be personalised by an uploaded photo or the shared video camera. Communication with others takes place via chat or microphone. The rooms are furnished differently for the respective intended use, as shown in Figure 1. For example, there is a large lecture hall, several smaller study rooms, a library, but also a student café or a chill-out room to listen to music together and have a virtual party. The first evaluations of this use of augmented reality with students are encouraging. In the next stage of expansion, virtual reality headsets will be used.



Figure 1: Students interacting with each other in a space created with Areeka Studio.

Conclusions

Even though the last few semesters have impressively demonstrated that large parts of university teaching can also be realized digitally, it has also become clear that face-to-face teaching continues to have great strengths and is therefore justified. It is anticipated that students and teaching staff alike will continue to seek personal contact, although the value of this jointly invested time will be better and more efficiently spent (Entner *et al.*, 2021; Berghoff *et al.* 2021). Although not all thinkable wishes could be fulfilled so far, we are much closer to a normality of digital teaching today than we were a few years ago.

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