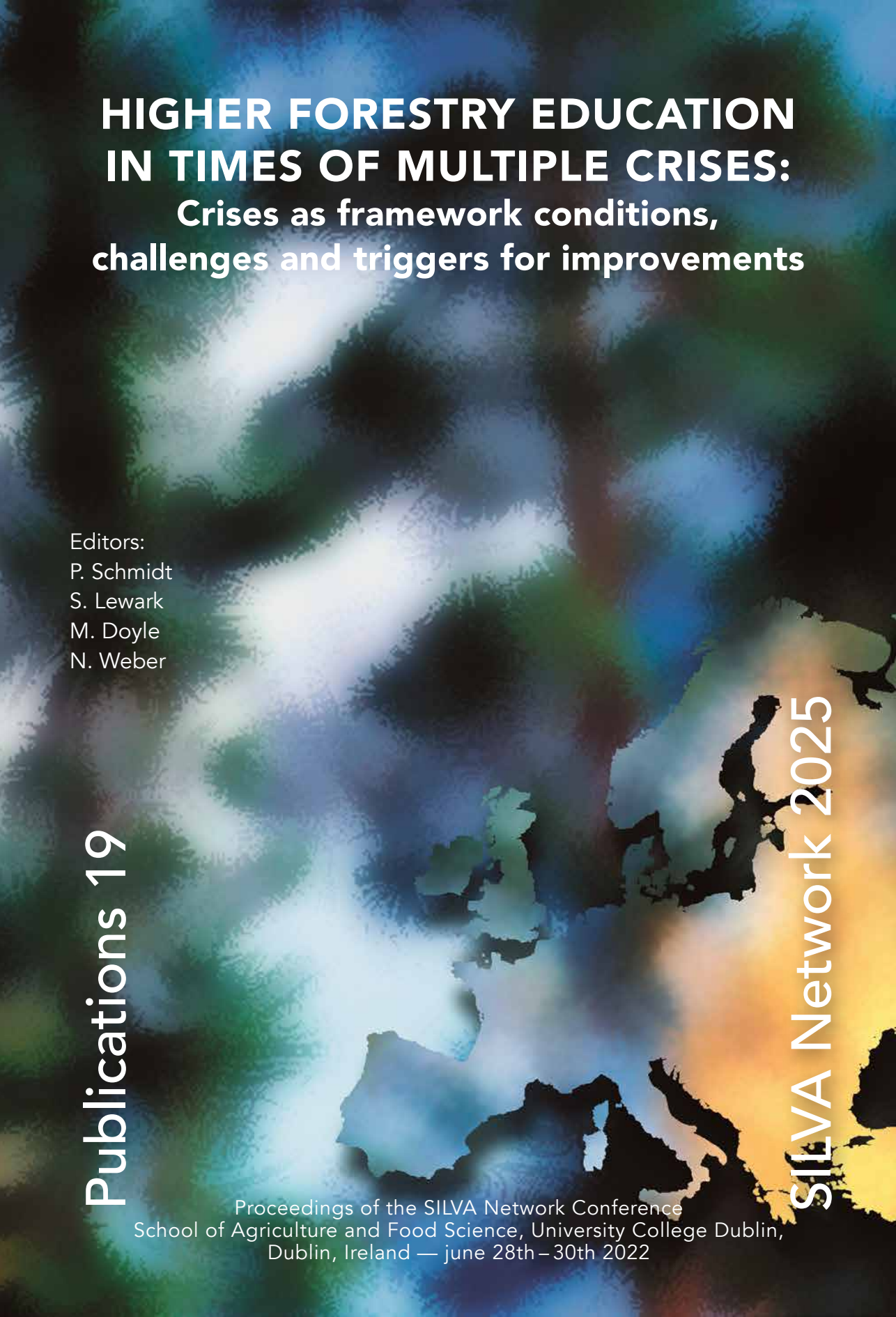
HIGHER FORESTRY EDUCATION IN TIMES OF MULTIPLE CRISES:

Crises as framework conditions, challenges and triggers for improvements

Editors:
P. Schmidt
S. Lewark
M. Doyle
N. Weber



Publications 19

SILVA Network 2025

Proceedings of the SILVA Network Conference
School of Agriculture and Food Science, University College Dublin,
Dublin, Ireland — june 28th – 30th 2022

Higher forestry education in times of multiple crises: crises as framework conditions, challenges and triggers for improvements

Proceedings of the SILVA Network Conference
held at the

School of Agriculture and Food Science

University College Dublin, Dublin, Ireland

June 28th – 30th 2022

SILVA Publications 19
2025

Editors

P. Schmidt, S. Lewark, M. Doyle, N. Weber

This book is jointly published at the Technische Universität Dresden and the Sächsische Landesbibliothek – Staats- und Universitätsbibliothek Dresden, Germany.

Keywords: Higher forestry education, crises, Covid 19, transition to distance learning and teaching, teachers and students experiences.

DOI: 10.25368/2025.011

Please cite this publication as:

Schmidt, Pieter; Lewark, S.; Doyle, M.; Weber, N. (2025): Higher forestry education in times of multiple crises: crises as framework conditions, challenges and triggers for improvements. SILVA Publications 19, Dublin. DOI: 10.25368/2025.011

PREFACE 2022

It is with great pleasure that the editors present to you SILVA Publications nr 19.

At this moment and in today's world, forestry can play an essential role in diminishing effects of climatic change. Higher forestry education lays here a fundament, preparing foresters for their role in this world. Forestry education, at all levels, is more important than ever and special subjects of actual forestry education are addressed in this issue.

Silva Publication 19 is the first issue that is published in a digital-only format. The SILVA Network joins herewith the recent developments and adapt to the new world. We do hope that readers and members still will find this Publication and reflect on the content. We hope that perhaps they can even, as an active participant in higher forestry education, improve their teaching.

Processing this publication took, due to an unexpected illness of one of the editors, longer than expected and hoped. Happily, he is now recovered and we ask the authors and readers to excuse for the delay.

We wish you informative reading.

The Editors

PREFACE II

WELCOME TO UNIVERSITY COLLEGE DUBLIN

The SILVA Network Conference of 2022 was held in UCD, Dublin, Ireland and was a return to in-person events after the challenging COVID period. Notwithstanding the extensive travel disturbances experienced across Europe, associated with high passenger numbers and airport staffing issues, it was wonderful to welcome attendees to UCD.

Our School of Agriculture and Food Science has roots that date back to 1838 and the Glasnevin Model Farm and Albert College on the north side of Dublin city. In 1926 the Faculty of Agriculture at UCD was established under the University Education (Agriculture and Dairy Science) Act and higher forestry education has been an important component of our teaching and research ever since.

There are a few contextual points that are worth making before reading:

- Global demand for forest products is growing, as is the focus on biodiversity and demand for the provision of recreation; striving to meet competing, sometimes conflicting, demands remains challenging
- The shortage of professional foresters is an issue that is not confined to Ireland and student recruitment needs to be addressed to ensure the appropriate management of our forest resources into the future
- In Ireland, we have a low level of forest cover at 11% and although Government policy aims to support the expansion of the forest estate, the cumbersome licensing arrangements for planting, harvesting and road construction, have in recent years undermined confidence in forestry as a viable land use option
- The move to remote teaching and learning during the Covid 19 pandemic brought its own set of challenges for both students and educators but ultimately provided an opportunity for the development of innovative learning experiences that can be retained as we returned to in person learning.
- On the 'plus' side, higher forestry education and practice continues to adapt as the focus shifts to more holistic management and closer to nature silvicultural systems. In addition, on an optimistic note, the significant investment in forest recreation (an example of which will be visited on during the excursion) and ongoing technical developments in wood processing, ensure that the sector continues to provide a wide range of opportunities for our graduates.

In the context of the myriad of challenges facing forestry, the SILVA Network's remit of 'stimulating and facilitating educational co-operation in the field of forestry in Europe' has never been more important and the topic of this year's conference, in addressing higher education in Forestry in times of multiple crises, is timely.

I wish you all fruitful days of reading – it is a really interesting programme. I congratulate my colleague Marie Doyle for organising the conference and enabling UCD to host this important event. I hope you enjoy UCD and Dublin.

Frank Monahan
Dean of Agriculture and Head of the School of Agriculture and Food Science
University College Dublin

Participants

CONTENTS

SUMMARY

PIETER SCHMIDT

Crises are part of life on earth and varying in scale (local, regional, global) and time (from short term to long term). Many of them are relevant for forestry and forestry education. Specially, the Covid-19[1] pandemic is a drastic example, which has had negative impacts on teaching and learning. In his introduction NORBERT WEBER (president of the SILVA Network) stated that this crisis perhaps could have a positive side-effect in a growing competence in digital teaching and learning in higher forestry education. Some examples are discussed below, expanded, as is the tradition in the SILVA Network, with contributions concerning higher forestry education.

The FAO-ITTO-IUFRO Global Assessment of Forest Education (GAFE) 2020-2021 aimed, according to its chairman MIKA REKOLA, to assess goals, achievements and gaps in forest education at all levels of formal education. The project was also aimed tot catalyse and enhance forest education. A survey was carried out over all continents and all education levels, including professionals, teachers and students, totalling in 2471 responses. The main results concerning university level education were identifying gaps in education, such as social issues and traditional knowledge in forestry and a limited availability of practical learning opportunities in the curricula. Part-time professional jobs, which could improve chances on the labour market, were sufficiently available for students in North America. About two-thirds of the respondents indicated that in education digital tools were used moderately or extensively, mainly tools for communication and publication, for net based research, and geospatial tools. A key finding of the global assessment is that in all regions, graduates are considered moderately prepared to enter the workforce. The study revealed a need to improve some generic competences, increase practical experience, digital readiness, and to improve gender and minority equality.

In March 2019, at the onset of the SARS-CoV-2 pandemic, the Warsaw University of Life Sciences (SGGW) was unprepared to realize remote teaching. However, within 2-3 months, the University introduced the Microsoft Teams platform, provided training for teachers, and switched to online teaching. In order to gather students' feedback on remote learning, two surveys were conducted by MARTA ALEKSANDROWICZ-TRZCIŃSKA, EMILIA JANECZKO and KAROL BRONISZ, the first

[1] The various authors indicated the Covid-16 pandemic with the notation normally used in their country. The editors did not change this.

after the summer semester of 2019/2020 and the second after winter semester of 2020/2021.
The survey results indicated a low level of student motivation to learn in both semesters. In the second survey, students rated their technical preparedness (internet connection) much higher. Additionally, they expressed greater satisfaction with the technical quality of materials provided by teachers, their usefulness, and the effectiveness of remote classes in acquiring knowledge and skills.

It is worth noting that the Faculty of Forestry implemented a hybrid (blended) teaching approach. Certain field and laboratory classes, crucial for achieving specific learning outcomes through direct interaction with teachers, were conducted traditionally, while maintaining the sanitary regime. The survey findings also indicated that, at the time of the survey, both teachers and students at the Faculty of Forestry are adequately prepared and equipped to engage in remote classes. Nevertheless, to ensure effective knowledge and skill acquisition, certain classes such as field and laboratory courses should still be based on personal contact with the teacher.

The year 2020 is unique in recent history with the Covid-19 pandemic and the spread of online teaching methods in universities across the world. The research questions discussed here by ALEX BIMBO ONATUNJI focus on how online or hybrid teaching technologies were used for higher forestry education, the challenges faced by students and lecturers in the use of these tools, and on the perceived prospects of the use of these learning technologies beyond the pandemic. He surveyed students from developed countries (Italy and Spain) and developing countries (Nigeria and Uganda). The 238 responses (80% from Africa) indicate that relatively more European students followed online teaching, both before and during the pandemic. Inability to go on field trips posed a challenge to both lecturers and students, and replacement with virtual reality field trips garners the lowest interest among the students. On the prospects of digital higher forestry education beyond the COVID-19 pandemic, European students rank introduction of new topics very high while the African students favour the improvement of soft skills. In conclusion, the results show that online or hybrid training have good prospects in higher forestry education.

The current era is one of many crises and global challenges. ANNE NEVGI, NICLAS SANDSTRÖM and MIKA REKOLA stated that this is particularly relevant for the field of silviculture as it can serve to meeting the climate change and other challenges of sustainable development. A recent study on forestry education in Europe highlighted the lack of attention to forest services and the fact that curricula address few cultural and social themes that are discussed controversially, such as aspects of gender, ethnicity, and indigenous peoples in forestry education. It has been recognized that forestry teachers need to prepare their students not only to be experts in technical forestry skills, but also to be able to communicate and work with people from diverse backgrounds. These challenges put pressure on the pedagogical skills of

forestry teachers in terms of teaching issues that may be culturally challenging. In addition, forestry teachers are challenged to develop new ways of online and hybrid teaching. Many attempts have been made to improve teaching methods in forestry education, but there is also a need to improve forestry teachers' pedagogical competence and teaching skills. The problems are related to social and cultural issues in general, and to ethnicity, gender, and to the roles of indigenous peoples in particular; these findings challenge teachers to reflect on their values, and on their moral courage to openly discuss these with their students. Forestry teachers need to become reflective teachers and a teaching portfolio is one of the best reflective tools for developing teaching skills and teacher competency. In addition, teaching portfolios have been used to assess teachers' teaching skills when recruiting candidates for teaching positions or promoting teachers in their academic careers. This paper discusses professional development, the continuous interplay between content and theory and teaching practices, and how teaching portfolios can be used as a reflective tool to improve forestry educators' pedagogical competence to tackle difficult issues in forestry education and to prepare their students to meet the challenges of the future.

VERA STEINBERG presented the role of Forest Europe. This pan European initiative, also known as the Ministerial Conference on the Protection of Forests in Europe has under the German chairmanship three main streams; one of these is 'Green Jobs and Forestry Education'. Progress here and the possible cooperation with the SILVA Network was discussed.

Summarizing, it could be stated that

- It is a pity that only so few of the presentations resulted in a paper published here.
- The necessity to continue higher forestry education at universities became a virtue: notwithstanding errors and gaps, the transformation of traditional education into a more on line education proved moderately successful. However, the education in the real forest proved difficult and should in these circumstances be improved.

INTRODUCTION

NORBERT WEBER

Crises are part of life on earth and varying in scale (local, regional, global) and time (from short term to long term). Many of them are relevant for forestry and forestry education. Strictly speaking, a crisis can already occur in the lecture hall on micro-level when students did not prepare for discussion of an assignment. Regional crises might result from large-scale hurricanes or forest fires. On the macro-level, against the background of the Covid-19 pandemic as well as increasing environmental hazards and armed conflicts in several parts of the World, the term "multiple crises" has been increasingly used by political and societal actors in recent decades. These crises are affecting both humans and the human environment substantially. Severe and longer lasting crises might result in poverty, inequality and even destabilization of the political situation in a country. In the best case, they are leading to reorganization of administrative structures, entrepreneurial innovation and civil engagement.

It goes without saying that serious crises like armed conflicts and environmental disasters, unfortunately occurring in several parts of the World, are influencing higher forestry education to a considerable extent. There is a broad range of effects, beginning with decreasing availability of lecturers due to military service. Student situation deteriorates as well what mirrors in applicant numbers and partially lower entrance qualifications when education at schools cannot be secured in a regular way. Personal wellbeing of students in conflict regions is not only impaired by unfavourable framework conditions like frequent and long-lasting blackouts but also the danger to lose one's life. Universities in affected areas are suffering from destroyed infrastructure and often restricted financial resources.

Especially with regard to the Covid-19 pandemic, a positive side-effect might be seen in shifting competence in digital teaching and learning on a higher level. Fortunately, students in times of Corona learned a lot about self-organized learning and personal resilience. This was particularly the case for foreign students whose arrival in their host countries fell exactly in the time of highest restrictions, as one of the presentations of this SILVA Annual Conference in Dublin showed impressively.

As crises are here to stay and often occur unexpectedly, crisis management is key. Taking a closer look at higher forestry education, it seems crucial to address crises and related phenomena permanently as topics in teaching and learning (natural crises, societal crises, resilience, prevention, adaptation, mitigation, handling wicked problems etc.). First and foremost graduates should be prepared to manage future threats, even those that are not yet visible at the horizon. For that reason, teaching and learning aims should include crisis management skills, especially crisis

communication and adaptive learning. Although there are some promising examples, e.g. curricula that have been enriched with topics around management of environmental crises, we are still at the begin of that journey.

KEYNOTE

THE FAO-ITTO-IUFRO GLOBAL ASSESSMENT OF FOREST EDUCATION – REFLECTIONS TO UNIVERSITY EDUCATION

MIKA REKOLA

Abstract
The FAO-ITTO-IUFRO Global Assessment of Forest Education (GAFE) 2020-2021 aimed at assessing the goals, achievements and gaps of forestry education at all levels of formal education. The project was also aiming to catalyse and enhance forestry education. Main results concerning university level education were identifying gaps in education, such as social issues and traditional knowledge in forestry curricula. The study revealed a need to improve some generic competences, increase practical experience, digital readiness and improve gender and minority equality.

Keywords: assessment, forestry education, universities

Introduction

In order to attain sustainable forest management (SFM) several actions and underpinning are needed. Among those forestry education is the primary means of creating the knowledge, skills and shared values to the achievement of environmental, social and economic development goals from local to global levels. A main challenge with forest education around the world has been the need to cover all forest-relevant topics within curricula (van Lierop, 2003; Temu and Kiwia, 2008; Rekola *et al.*, 2017; Jegatheswaran *et al.*, 2018; Sharik *et al.*, 2019, 2020).

Global Forest Resources Assessment (GFRA) 2020 of the Food and Agriculture Organization of the United Nations (FAO) (FAO, 2020) has shown that between 2000 and 2015, there has been a general increase in the number of forestry graduates and a marked advancement towards gender parity.

Forest education has been largely missing from the global forest policy agenda for nearly 20 years. Recently, however, there has been a rekindled interest in forest education, as reflected in increased activities of various research organizations and non-governmental organizations (NGOs), and, notably, the inclusion of forest education in the agenda of the 14th session of the United Nations Forum on Forests held in May 2019 (https://enb.iisd.org/events/14th-session-un-forum-forests-unff14).

This signals a growing realization that forest education can and must be part of the solution to many pressing sustainability challenges

The Global Forest Education Project (GFEP), formally entitled "Creation of a Global Forest Education Platform and Launch of a Joint Initiative under the Aegis of the Collaborative Partnership on Forests" was carried out from 2019 to 2021. It was generously funded by Germany's Federal Ministry for Food and Agriculture (BMEL). The project was implemented by three lead project partners: the Food and Agriculture Organization of the United Nations (FAO), the International Tropical Timber Organization (ITTO), and the International Union of Forest Research Organizations (IUFRO), with the collaboration in some project activities of other members of the Collaborative Partnership on Forests (CPF) and of regional lead partners. Aims of the project was first, to execute an inventory of ongoing activities, key actors, objectives and achievements on all levels of forest education: primary, secondary, Technical and Vocational Education and Training (TVET), and universities and colleges; and second to find new options for activities in addressing gaps in forest education (https://www.fao.org/forestry/forest-education/en/).

Forest education was defined in the project so that "it covers education and training related to forests, trees outside forests, and other wooded land (i.e., natural forests, forest plantations, woodlands, agroforests and urban forests). It includes education delivered through programmes of forestry and forest sciences as well as programmes of broader scope (e.g., natural resource management, environmental sciences)" (Rekola and Sharik, 2022).

Reports from six FAO regions were the basis for the Global Assessment of Forest Education (GAFE) which then summarised the results at global level (Rekola and Sharik, 2022). This was the first time ever that all these levels of education have been assessed on global scale. This paper summarizes some of the key results of GAFE concerning university and colleges at global scale and presents some key findings from the European regional report (Rekola *et al.*, 2021).

Frame of reference

The Global Forest Education Project adopted a frame of reference in order to define the questions posed in the global survey in 2020. The frame of reference consists of four main components of forest education and their relationships (Figure 1).

'Needs and demand' describe the objectives for education, 'needs' defining as general socially desirable objectives, in particular the Sustainable Development Goals (SDGs), and 'demand' referring to more narrowly defined (economic) requirements on how much and which kinds of skills and competencies are required by the labour market. 'Supply and resources' are inputs, such as human resources

and learning environments, needed to organize and implement education. There are direct and indirect links between 'Needs and demand' and 'Supply and resources'. 'Teaching and learning activities´ are mutually interacting activities and the essential and central components of education. Learning takes place constantly, however, in organized and structured learning environments, teaching is key to successful intended ´learning outcomes´ (see, for example, Biggs and Tang, 2011). With learning outcomes are meant the competencies of students upon graduation, including their knowledge and skills, but also their attitudes and values. Competences can be classified as subject-specific – i.e. related to forest-based knowledge, and generic skills such as literacy and numeracy, communication, and leadership.

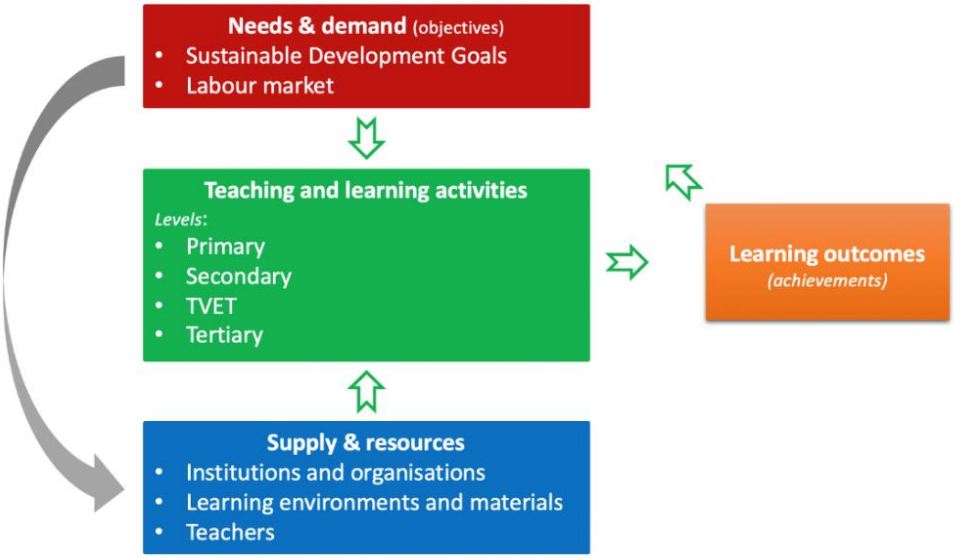


Figure 1. Frame of reference for the assessment of forest education

Data and methods

The GFEP was executed in six regions covering the globe: Africa (AF), Asia-Pacific (AP), Europe (EU), Latin America and the Caribbean (LAC), Near East and North Africa (NENA), and North America (NA) (Figure 2). All four levels of formal education were included:

- Primary education (in most countries from age 5 or 6 to age 12 or 13);
- Secondary education (in most countries from age 12 or 13 to age 17 or 18);
- Technical and vocational education and training (TVET);
- Universities and colleges (UC).

Taking into account the aims of the study, an online survey questionnaire was created to cover the range of topics including education content and competencies; teaching approaches; educational resources and policy; workplace readiness and employability; digital readiness; and general development and trends in education.

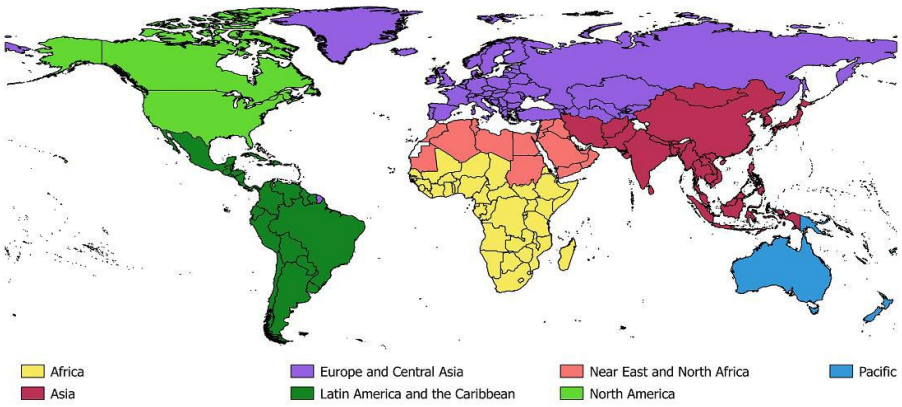


Figure 2. Six regions in the global forest education survey. Source: FAO

Education content and competences included more than 20 items, the exact number depending on the level of education. The approach was to measure the gap in teaching and learning between desired and actual levels, using the wording "To what extent are the following topics and skills covered in education". This gap analysis and the way the questions were formulated assume that respondents take into account at the same time the importance of topics and skills, their teaching and learning methods, and learning outcomes (see gap analysis, for example, in Arevalo *et al.*, 2012).

Most of the questions applied a semantic differential scale, whereas some questions were open-ended, permitting the respondent to provide a written response. The survey questionnaires were translated in 14 languages. Webropol, an online survey and reporting tool, was used to dispatch the surveys and manage the data received (Webropol.com).

Three different questionnaires were created, one for each of the following target groups:

- Professionals. Forest professionals working in government organizations, business organizations (the private sector), labour unions, forest owners' associations, and environmental and other non-governmental organizations (Questionnaire 1).
- Teachers. Teachers and administrators in primary schools, secondary schools, TVET institutions, and universities and colleges (Questionnaire 2).

- Students. Enrolled or recently graduated students of forestry and forest-related programmes in TVET schools and in universities and colleges (Questionnaire 3).

Statistical samples were drawn to represent countries and target groups in each region.

This strategy was supplemented with snowball sampling, which was applied by sending an open invitation to take the survey through social media channels, such as Twitter.

Combining respondents in both statistical and snowball samples the global survey data were based on a total of 2741 online responses (Table 1). Respondents were relatively evenly distributed between target groups, professionals (n=968), teachers (n=963) and students (n=840). However, there were large differences between regions in the number of respondents.

Table 1. Respondents by target group and regions

	Professionals	**Teachers**	**Students**	**Total**	**% of total**
1 Africa (AF)	136	117	129	382	14
2 Asia and the Pacific (AP)	180	145	113	438	16.2
3 Europe (EU)	170	173	118	461	17.0
4 Latin America and the Caribbean (LAC)	274	333	289	896	32.0
4 Near East and North Africa (NENA)	34	36	5	75	2.8
6 North America (NA)	144	159	186	489	18.0
Total	968	963	840	2741	100.0

Overall, a majority (59.4 percent) of respondents reported to be male, but among students only 50.8 percent of respondents. More than half of the students reported that they were studying in their own home country, whereas, one quarter of students studied in a foreign country aiming to receive a degree or as an exchange student.

Results

Enrolment

Professional and teacher respondent groups provided survey responses to questions about enrolment trends over the past decade. Answers were mixed within and across regions. In the EU region most of the teachers saw that the overall trend in BSc student enrolment was stable, whereas professionals' responses were divided between two different perceptions. Four out of ten professionals considered the trend in student enrolment either decreasing or increasing, and only two out of ten saw it was stable. More than 50 percent of the teachers perceived that the student enrolment in forestry MSc and Doctoral study programmes had remained stable,

however, less than 20 percent of the professionals hold the same perception, and instead approximately 40 percent of them reported that the student enrolment to these programmes had been increasing.

Curricula topics and skills

The university and college level respondents were asked to evaluate the BSc, MSc/Doctoral level curriculum coverage of the following themes:

- Forest resources and forest ecology;
- Forests/trees, planning and management;
- Forest health;
- Forest services and cultural and social issues;
- Forest enterprise;
- Forest policy and economics;
- Generic skills.

These seven themes consisted of altogether 45 specific topics and skills (Table 2).

Table 2. Coverage of forest-related themes, topics and skills in university programmes.

Themes and specific topics and skills
Forest resources and forest ecology:
Forest biodiversity
Forest soils
Forest ecology
Wood and non-wood forest products
Forest genetic resources
Forest/tree planning and management:
Forests and climate change
Forest mapping, inventory, remote sensing and GIS
Forest planning
Silviculture
Forest landscape restoration
Range management
Sustainable harvesting systems
Agroforestry
Watershed management
Wildlife management
Forest health
Forest fire management
Forest conservation
Urban forestry
Forest services and cultural and social issues:
Wood as renewable energy
Forests-based recreation
Traditional and/or indigenous forest-related knowledge
Cultural values of forests and trees
Forests and human health
Forests, trees and gender issues
Forests, trees and ethnicity issues
Forestry enterprise:
Entrepreneurship

Forest industry, marketing and management
Wood technology
Small-scale forest-based enterprise

Forest policy and economics:

Forest policy and legislation
Forest tenure and governance
Forest/natural resource/environmental economics
Small-scale forestry

Generic skills:

STEM (science, technology, engineering, math)
Critical thinking and analytical skills
Creative thinking
Information management skills
Collaboration and teamwork
Leadership and management
Communication (e.g., writing, oral, digital communication)

Other skills:

Research skills
Scientific writing
Practical field skills
Professional ethics

The education curricula contents were measured in a semantic scale - 1 = inadequately covered, 2 = sufficiently covered, 3 = excessively covered - were straight-forward to interpret. Values below 1.5 indicates that the majority of respondents considered the topic to be inadequately covered.

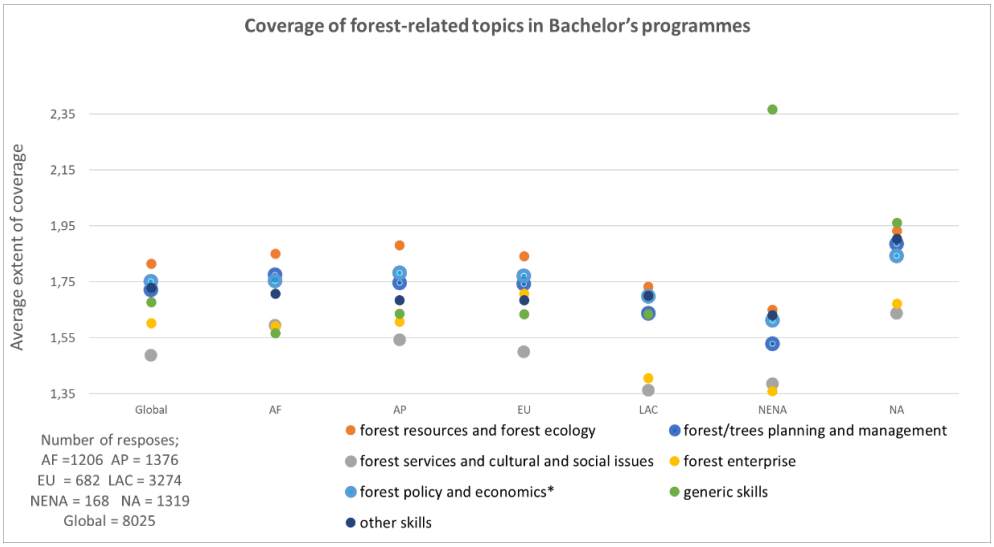


Figure 2. Coverage of forest-related topics in bachelor's programmes.

Globally, most of the topics and skills in the BSc level were on average between inadequately and sufficiently covered (Figure 2). Forest resources and forest ecology, followed by forest policy and economics; had the highest scores, the lowest

was for forest services and cultural and social issues. Within each of these seven themes there was variation among individual topics and skills, in some cases ranging from inadequately to excessively covered.
The best overall topics scores were in the NA region (1.83), followed by the AF, AP, EU regions which had similar average scores, and the NENA and LAC regions which had the lowest average scores (1.60). Some topics were clearly considered sufficiently covered, for instance, in the EU region, more than 60 percent of all respondents reported that forest biodiversity, forest soils, forest ecology, and wood and non-wood forest products (NWFP) were sufficiently covered. Results concerning generic skills were scored more or less on average among all topics. However, there were variations within these topics.

Education content and competencies for the MSc/Doctoral' s level were in general similar to those for the bachelor's level. Within the theme of forest services and cultural and social issues, the following topics were considered inadequately covered in all regions: forests, trees and gender issues; traditional and/or indigenous forest-related knowledge; cultural values of forest and trees; and forests and human health. From regional results considering EU, entrepreneurship and small-scale forest enterprise topics were seen as very inadequately covered by professionals and by most teachers, whereas students considered them sufficiently covered.

Education resources and digital readiness
Globally, the availability of teaching resources varied considerably among regions, however, the four categories of educational resources exhibited the same level of availability on average, approaching moderate levels. Figure 3 shows results on MSc/Doctoral level, however, results were on average similar in BSc level. The educational resources were considered most in the NA region followed by the EU region, both at levels between moderately to very much available. The lowest availability of resources was reported in the AP and NENA regions (Figure 3). Some differences among respondent groups were also detected. For example, in the AP and EU regions, students were the least critical of the availability of resources in degree programmes whereas professionals were the most critical.

In EU, the professional respondent group was the most critical about BSc level education resources, so that around 35 percent of them considered that teachers (quality and quantity of education) is available to a limited extent. On the contrary, the majority of teachers and students reported that teacher resources are available moderately or very much. In MSc and Doctoral level all respondent groups were especially critical on terms of practical opportunities, such as experiential learning, practical training, and field visit. Every four out of ten professional saw that these resources are not at all or to a limited extent available. Nearly every fifth of teachers and students had similar perception as professionals had.

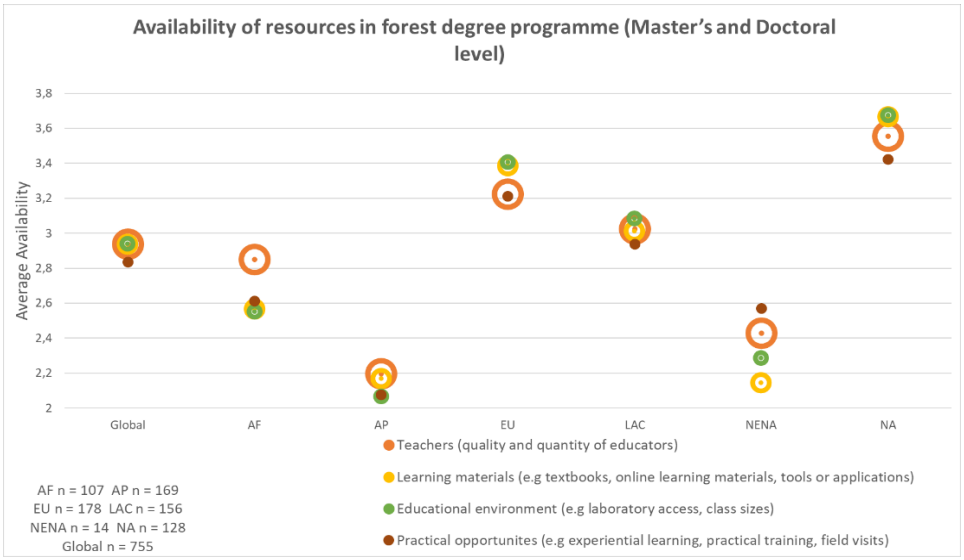


Figure 3. Availability of resources in forest degree programmes at the Master's and Doctoral level. Y axis scale: 1= not at all, 2= to a limited extent, 3= moderately, 4 = very much.

The global survey asked about the use of seven categories of digital tools in teaching. Digital tools in general were highly valued in all regions by all respondent groups. However, perceptions of the current use of these tools varied. The greatest use was reported in EU and NA, followed by the LAC region.

In MSc and Doctoral levels (lumped together in the survey) the majority of EU respondents (63-74 percent) reported that digital tools are used moderately or very much. However, nearly 40 percent of the professionals, 25 percent of the teachers and 30 percent of the students evaluated that digital tools are used only to a limited extent or not at all. All groups also considered that those tools would be a moderately or very much valuable supplement at university and college level studies. The highest percentages were mostly given by teachers.

Of all the tools, Communication and publication tools and Net-based research tools were the highest voted tools in EU region. Geospatial tools were also rather commonly used among all respondent groups. Whereas, the figures for enhanced media such as augmented or virtual reality were the lowest among all respondents (Figure 4).

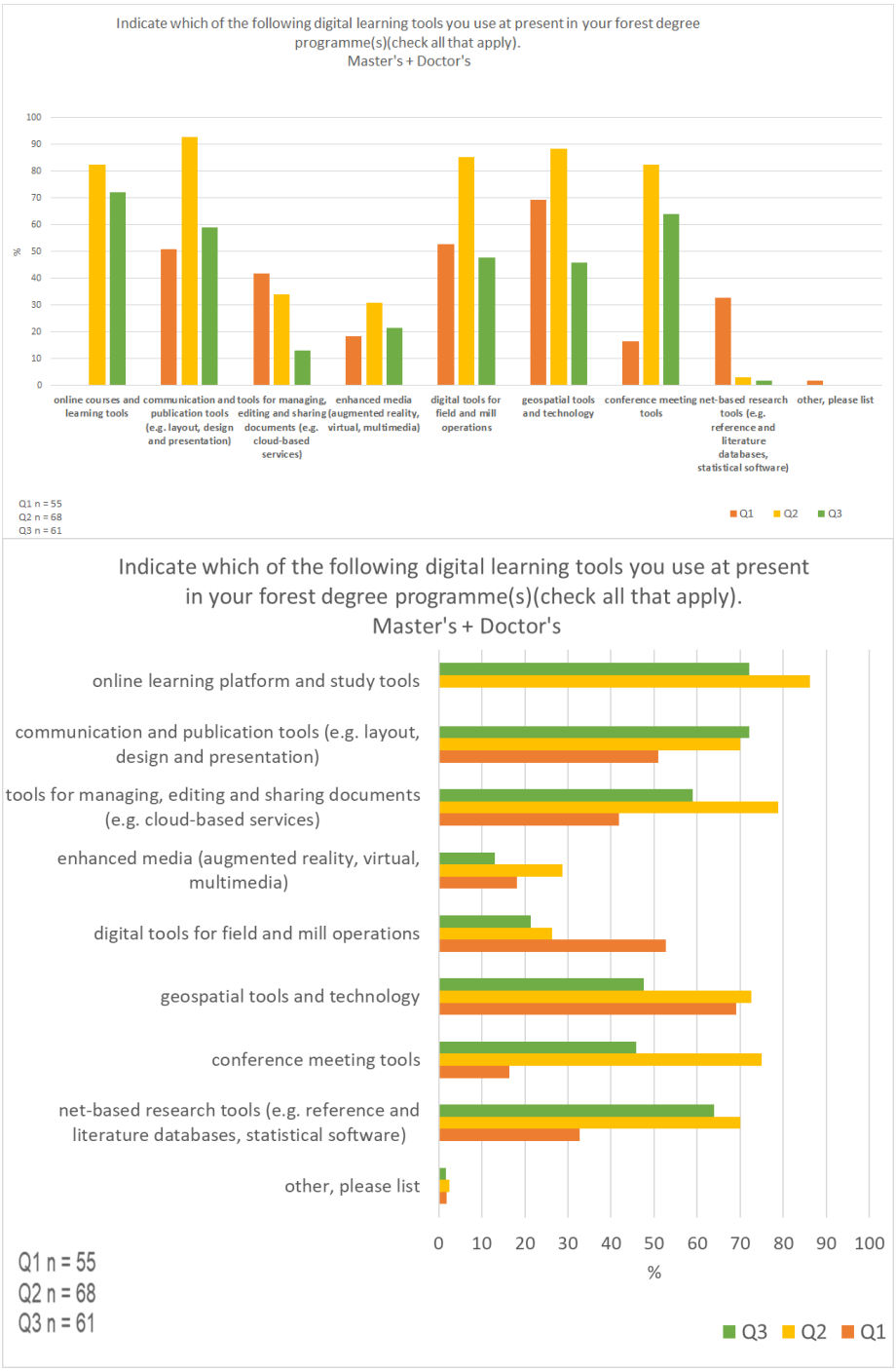


Figure 4. Use of digital learning tools in degree programmes (Master's and Doctor's) in EU region. Q1 = professionals, Q2 = teachers, Q3 = students.

Working life and employability
All respondents evaluated the availability and effectiveness of part-time forest-related employment or internships for students. All groups in all regions agreed that these activities would increase student's competences. The global picture given was that part-time forest-related employment or internships were not available at all or were available to only a limited extent both in BSc and MSc/Doctoral levels. The exception was the North America region where teachers and students considered that part-time forest-related employment or internships were available moderately to very much. Teachers in the EU region also had this perception.

Among all respondent groups on average forest education is moderately preparing both BSc and MSc/Doctoral students to enter the workforce. Professionals were in any region the most critical, in EU region approximately 40 percent responding that programmes are not successful in preparing students to enter the workforce (provide percentages of "not at all" or "to limited extent" here).

Gender as an issue in employment was evaluated in two aspects, first, it was asked whether gender is a factor in a graduate's ability to find a forest-related job, and second, it was asked to what extent does gender influence the kinds of jobs graduates are considered for. In EU region the first questions received similar responses by all respondent groups, that is, around 30 percent of all saw that gender influences "moderately" or "very much" graduates' ability for forest-related employment. In the second question responses were more diverse. Of professionals almost 50 percent considered that gender influences the kinds of jobs moderately or very much. The same figures for teachers and students were around 30 percent and 25 percent respectively.

Discussion and Conclusions

One of the most persistent results from GAFE was that the professional respondents were more critical than the teachers and students. For instance, it is interesting to note that the professional respondents consistently indicated a lower level of workplace readiness than did the teachers and students. They were also more critical about the availability of education resources.

The fact that professionals were asked to consider the enrolment in university education as a whole and whereas teachers were asked to focus on their own programme might explain some of the variability in responses related to enrolment.

Discussions regarding university level forestry curricula revisions have focussed on generic skills (soft skills), socio-economic and cultural aspects already for a long time (Barrett, 1953; Bullard, 2015; Sample *et al.*, 2015; Sharik *et al.*, 2020; Rekola *et al.*, 2018; Rouleau *et al.*, 2017). This study found that many of these topics are

today sufficiently covered in forest education, others are not yet covered well enough. We may consider that new emerging topics such as forests and human health, gender, race and ethnicity could be better met in teaching if high quality teaching materials are available. This especially because teachers and/or researchers specialized on these topics are rare and hardly exist in most universities.

In the GAFE study a special emphasis was given to the use of digital tools and it was found that they are not as frequently used as expected. It seems that teachers assumed digital tools were used more often than what was perceived by students. Teachers are much more than students willing to apply more online learning and enhanced media. These differences might be also because students do not simply recognize all applications they are using and the potential worth of new tools. A certain level of digital fatigue during excessive remote studies and work due to the COVID-19 pandemic might explain some of the perceptions.

Results concerning curricula were the largest part of GAFE. First, it seems forest education has challenges with gender and minority issues in curricula. These topics are not relevant only as an enrolment issue but they should be a part of competence portfolio learnt through curriculum (Follo, 2002; Arevalo *et al.*, 2012; Gharis *et al.*, 2017; Sharik *et al.*, 2015; Bal and Sharik, 2019). Second, there were gaps in Traditional and/or indigenous forest-related knowledge and Cultural values of forests and trees. These topics are based on highly different forest management and meanings across the European region - from Portugal having traditional cork production to Northern part of Nordic countries where the only indigenous group of Europeans, Sami people, are living and still doing traditional open access reindeer husbandry in forests (Cogos *et al.*, 2019; Wolpert *et al*, 2020). Forest related sayings and habits are part of the forest cultural history worth of education and evidently lacking in current education (Schmithüsen, 2008; Paaskoski, 2014; Hiltunen *et al.*, 2020). Third, the topic Urban forestry and Forests and human health has been recognized in Europe for a long time (Konijnendijk *et al.*, 2006) and also as an education topic (Konijnendijk, 2003; Vukovic, 2017; Van Herzele *et al.*, 2005). A relatively new research topic is about health effects of forest recreation (Park *et al.*, 2009) and so-called forest bathing (Mao *et al.*, 2012). No studies were found on how these issues are taught in tertiary education.
Educational resources were seen differently by the respondent groups so that professionals saw the largest shortages in the availability of resources. The most critical resource was practical opportunities, such as experiential learning, practical training, and field visits. These perceptions are straight-forward to interpret. However, the critical responses on the availability of teacher resources seem to call for further studies on whether it is about issues related to the quantity and quality of teaching.

The use of digital readiness was under closer investigation in this study. What was surprising, is that up to 50 percent of the respondents report that the use of digital

tools for learning is only to a “limited extent” or “moderately” helpful and valuable. Three out of four students were using communication and publications tools, a result that is all too low when we consider the competency needs for Masters’ and Doctoral level students. Teachers would like to use more enhanced media as a learning tools, but students do not. This is somewhat problematic. Most likely students have no or little experience on enhanced media in learning and they cannot yet envisage its potential (Domingo and Bradley, 2018).

When four out of ten professionals responded that programmes are not successful in preparing students to enter the workforce, this topic needs more investigation. Are professionals unsatisfied with so called Day One skills of recent graduates or is it something else such as unrealistic expectations about the graduates. There were also some differences between respondent groups about gender issues and labour market. Gender issues have recently been actual especially in many sectors, also some research has shown critical issues around forestry education. It seems based on both the survey results here and earlier literature that forestry and forestry education have still challenges with gender and minority equality. These groups are under-represented both in current workforce and among students (Follo, 2002; Gharis *et al.*, 2017; Bal and Sharik, 2019). Grubbström and Powell (2020) have recently shown how gender inequality is persisting in Swedish forestry education despite #MeToo campaigns.

A key finding of the global assessment is that in all regions graduates are considered moderately prepared to enter the workforce. Although this picture is better than some studies have shown in the past (e.g., Schmidt *et al.*, 2014), improvements are clearly needed to ensure graduates are ready for the workplace. Filling gaps in the curricula, providing more practical training and opportunities for internships and work, and improving digital readiness are the most urgent actions that could be taken to prepare university-level forest professionals for the job market.

References

Arevalo, J., Mola-Yudego, B., Pelkonen, P. and Qu, M., 2012: Students' views on forestry education: A cross-national comparison across three universities in Brazil, China and Finland. Forest Policy and Economics, 25: 123-131.

Bal T.L. and Sharik, T.L., 2019: Web content analysis of university forestry and related natural resources landing webpages in the United States in relation to student and faculty diversity. Journal of Forestry, 117(4): 379-397.

Barrett, J.W., 1953: The role of humanities and other liberal courses in the professional forestry curriculum. Journal of Forestry. 51(8): 574–578.

Biggs, J. B. and Tang, C., 2011: Teaching for quality learning at university: What the student does. Berkshire, UK: McGraw-Hill/Society for Research into Higher Education/Open University Press.

Bullard, S.H., 2015: Forestry curricula for the 21st Century-maintaining rigor, communicating relevance, building relationships. Journal of Forestry 113(6): 552-556.

Cogos, S., Östlund, L. and Roturier, S., 2019: Forest fire and indigenous Sami land use: place names, fire dynamics, and ecosystem change in Northern Scandinavia. Human Ecology, 47(1), 51-64.

Domingo, J. R. and Bradley, E.G., 2018: Education student perceptions of virtual reality as a learning tool. Journal of Educational Technology Systems, 46(3), 329-342.

FAO, 2020: Global Forest Resources Assessment 2020: Main report. FAO, Rome. https://doi.org/10.4060/ca9825en.

Follo, G., 2002: A hero's journey: Young women among males in forestry education. Journal of Rural Studies, 18(3): 293-306.

Gharis, L.W., Gull Laird, S. and Osborne D.C., 2017: How do university students perceive forestry and wildlife management degrees? Journal of Forestry 115(6). 540-547

Grubbström, A. and Powell, S., 2020: Persistent norms and the #MeToo effect in Swedish forestry education, Scandinavian Journal of Forest Research, DOI: 10.1080/02827581.2020.1791243

Hiltunen, K., Björklund, H., Nurmesjärvi, A., Purhonen, J., Rainio, M., Sääskilahti, N. and Vallius, A., 2020: Tale (s) of a Forest—Re-Creation of a Primeval Forest in Three Environmental Narratives. In Arts (Vol. 9, No. 4, p. 125). Multidisciplinary Digital Publishing Institute.

Jegatheswaran, R., Florin, I., Hazirah, A., Shukri, M. and Abdul Latib, S., 2018: Transforming forest education to meet the changing demands for professionals. Journal of Tropical Forest Science, 30(5), 431-438. Available at: www.jstor.org/stable/26514434.

Ketlhoilwe, M.J. and Jeremiah, K., 2010: Mainstreaming environment and sustainability issues in institutions of higher education: the case of the University of Botswana. International Journal of Scientific Research in Education, 3(1), 1-9.

Konijnendijk, C.C., 2003: A decade of urban forestry in Europe. Forest policy and Economics, 5(2), 173-186.

Konijnendijk, C.C., Ricard, R.M., Kenney, A. and Randrup, T.B., 2006: Defining urban forestry–A comparative perspective of North America and Europe. Urban forestry and urban greening, 4(3-4), 93-103.

Mao, G.X., Lan, X.G., Cao, Y.B., Chen, Z.M., He, Z.H., Lv, Y.D., and Jing, Y.A.N., 2012: Effects of short-term forest bathing on human health in a broad-leaved evergreen forest in Zhejiang Province, China. Biomedical and Environmental Sciences, 25(3), 317-324.

Paaskoski, L., 2014: Experienced, recollected, and reconstructed. Journal Nordic Museology/Nordisk Museologi, (1).

Park, B.J., Tsunetsugu, Y., Kasetani, T., Morikawa, T., Kagawa, T. and Miyazaki, Y., 2009: Physiological effects of forest recreation in a young conifer forest in Hinokage Town, Japan. Silva Fennica, 43(2), 291-301.

Rekola M., Nippala J., Tynjälä P. and Virtanen, A., 2018: Modelling competences and anticipating the future competence needs in the forest sector. Silva Fennica vol. 52 no. 3 article id 9983. 19 p. https://doi.org/10.14214/sf.9983

Rekola, M., Nevgi, A. and Sandström, N., 2021: Forest Education Regional Assessment: Europe. FAO - IUFRO project GCP /GLO/044/GER. Creation of a Global Forest Education Platform and Launch of a Joint Initiative under the Aegis of the Collaborative Partnership on Forests. https://www.fao.org/forestry/forest-education/99204/en/

Rekola, M., Abbas, D., Bal, T., Burns, J., Lackner, M., Rodriguez, S. and Sharik, T. (Eds), 2017: Global Outlook on Forest Education (GOFE) A Pilot Study Report. IUFRO-IFSA Task Force. Available online at https://foresteducation.files.wordpress.com/2017/09/gofe_final_report.pdf; last accessed Sept 27, 2018

Rekola, M. and Sharik, T.L., 2022: Global assessment of forest education – Creation of a Global Forest

Rouleau, M., Sharik, T.L., Whitens, S. and Wellstead, A, 2017: Enrolment Decision-Making in US Forestry and Related Natural Resource Degree Programs. Natural Sciences Education, 46(1).

Sample, V.A., Bixler, R.P., McDonough, M.H., Bullard, S.H. and Sniekus, M.M. 2015: The promise and performance of forestry education in the United States: Results of a survey of forestry employers, graduates, and educators. Journal of Forestry. 113(6):528–537.

Schmidt, P., Müller-Starck, G., Chubinsky, A. and Lewark, S. (Eds), 2014: Bologna cycles 1 to 3 and higher forest education – objectives and reality: Proceedings of the SILVA Network Conference Held at the Saint Petersburg State Forest Academy Saint Petersburg, Russian Federation, June 17th - June 19th 2010. SILVA Publications 9. SILVA Network, Freiburg, Germany. http://www.silva-network.eu/.

Schmithüsen, F.J., 2008: European forests: heritage of the past and options for the future. Working papers/Forest Policy and Forest Economics Department of Forest Sciences. International series, 2008(2).

Sharik, T.L., Storer, A.J., Bal, T.L. and Abas. D., 2020: Education as a driver of change in U.S. forests and the forest sector. pp. 84-99 In Dockry, M.J., Bengston, D.N. and Westphal, L.M. (Comps): Drivers of Change in U.S. Forests and Forestry over the Next 20 Years. Gen. Tech. Rep. NRS-P-197. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station. 99 p. https://doi.org/10.2737/NRS-GTR-P-197.

Sharik, T.L., Bal, T.L., Ziegler, P., Jalil, D. and Meeks, A., 2019: Enrolment trends in natural resources degree programmes in the US with an emphasis on diversity. Society of American Foresters National Convention, November 2, 2019, Louisville, KY.

Temu, A. and Kiwia, A., 2008: Future of forestry education: Responding to expanding societal needs. Nairobi: World Agroforestry Centre.

Van Herzele, A., Collins, K. and Tyrväinen, L., 2005: Involving people in urban forestry—A discussion of participatory practices throughout Europe. In Urban forests and trees (pp. 207-228). Springer, Berlin, Heidelberg.

Van Lierop, P., 2003: Trends in forestry education. Presented at the XII World Forestry Congress, Quebec City, Canada, 21-28 September 2003.

Vukovic, D.B., 2017: Urban forestry. Эко-потенциал, 3(19), 42-46.

Wolpert, F., Quintas-Soriano, C. and Plieninger, T., 2020: Exploring land-use histories of tree-crop landscapes: a cross-site comparison in the Mediterranean Basin. Sustainability Science, 1-17.

OPINION OF STUDENTS OF THE FACULTY OF FORESTRY OF THE WARSAW UNIVERSITY OF LIFE SCIENCES ON REMOTE LEARNING DURING THE PANDEMIC

MARTA ALEKSANDROWICZ-TRZCIŃSKA, EMILIA JANECZKO AND KAROL BRONISZ

Abstract
In March 2019, at the onset of the SARS-CoV-2 pandemic, the Warsaw University of Life Sciences (SGGW) was unprepared to enable remote teaching. However, within 2-3 months, the University introduced the Microsoft Teams platform, provided training for teachers, and switched to online teaching. In order to gather students' feedback on remote learning, two surveys were conducted, the first after the summer semester of 2019/2020 and the second after winter semester of 2020/2021.

The survey results indicated a low level of student motivation to learn in both semesters. In the second survey, students rated their technical preparedness (internet connection) much higher. Additionally, they expressed greater satisfaction with the technical quality of materials provided by teachers, their usefulness, and the effectiveness of remote classes in acquiring knowledge and skills.

It is worth noting that the Faculty of Forestry implemented a hybrid (blended) teaching approach. Certain field and laboratory classes, crucial for achieving specific learning outcomes through direct interaction with teachers, were conducted traditionally, while maintaining the sanitary regime. The survey findings also indicated that presently, both teachers and students at the Faculty of Forestry are adequately prepared and equipped to engage in remote classes. Nevertheless, to ensure effective knowledge and skill acquisition, certain classes such as field and laboratory courses should still be based on direct contact with the teacher.

Keywords: Corona pandemic, survey, motivation to learn, strengths and weaknesses of remote learning, higher forest education.

Introduction[2]

The remote learning, also known as distance learning, online learning, or e-learning, has been a subject of research for years (Przymuszała *et al.*, 2022). However, clear conclusions about its effectiveness compared to traditional teaching are still elusive (Ozkan and Koseler, 2009; Eom and Ashill, 2018). Prior to the pandemic, studies highlighted the advantages of remote learning, emphasizing the absence of physical and temporal constraints, increased course load potential, and the flexibility of self-paced study (O'Malley and McCraw, 1990). Additionally, there were observations that remote learning maintained high-quality teaching and learning at relatively low costs (Radović-Marković, 2010; Cook, 2014). Nevertheless, there are notable disadvantages, such as the necessity for consistent access to technology, potential feelings of isolation among students, and the challenge of maintaining focus (Young and Norgard, 2006; De Paepe *et al.*, 2017).

In March 2020, as the SARS-CoV-2 pandemic commenced, educational institutions worldwide were compelled to alter their modes of education and communication with students due to extraordinary circumstances. For the first time in history, the entire educational programme operated on a large scale, utilizing e-learning tools that relied on a variety of technological resources (Masalimova *et al.*, 2022; Şahin, 2022). At the onset of the pandemic, the Warsaw University of Life Sciences (SGGW), like many other universities, was unprepared for the extensive demands of remote teaching (Klimkowicz, 2020; Masalimova *et al.*, 2022). Initially, teachers utilized various platforms such as Zoom, Skype, and YouTube. However, within two to three months, the University lunched the Microsoft Teams platform as the primary space for remote education and provided training for teachers. Additionally, the University used the Moodle platform, which operates with a slightly different work philosophy. This flexible solution has the capability to integrate external tools, such as BigBlueButton (https://bigbluebutton.org/).

It is worth to notice that remote teaching conducted in time of crises, as in the Corona pandemic is called "emergency remote teaching". This term has emerged in this situation and used by online education researchers and professional practitioners to draw a line to earlier known and practiced high-quality online education (Hodges *et al.*, 2020).

[2] There is a variety of terms in the related literature, combining the terms education, learning and teaching with characteristics as online, remote, distance. The focus obviously is different for the different combined terms. In this text we use mostly "remote learning" and "remote teaching" and try to distinguish between learning and teaching at the respective parts of the text, while the focus is on the experiences of students, characterising their learning experiences and their views on the teaching activities of their teachers. This is expressed in the title of the text.

The study aimed to achieve three main objectives:

- to explore students' experiences and perceptions regarding the implemented remote learning at the Faculty of Forestry during the summer semester of 2019/2020 and the winter semester of 2020/2021,
- to consolidate the ongoing activities related to remote learning,
- to facilitate the creation of systemic solutions for remote learning by leveraging insights derived from the conducted surveys.

Methods

Surveys regarding students' opinions on remote learning were conducted twice, one after the summer semester 2019/2020 and the second one after the winter semester 2020/2021. Students from all faculties of the Warsaw University of Life Sciences, including the Faculty of Forestry, participated in the survey. Participation in the survey was voluntary. In the first survey, 66 students of the Faculty of Forestry responded, and in the second one 126 students (Table 1).

Table 1. The number of students who participated in the surveys.

Year of study	**Summer semester 2019/2020**	**Winter semester 2020/2021**
Bachelor programme, 1. Year	2	58
Bachelor programme, 2. Year	26	22
Bachelor programme, 3. Year	15	6
Master of Science programme, 1. Year	20	40
Master of Science programme, 2. Year	3	All students were graduated, not surveyed
In total	**66**	**126**

The questionnaire was developed by the Rector's Commission for the Quality of Education and sanctioned by the Vice-Rector for Didactics. Students responded to a total of twenty-eight closed and seven open-ended questions. Data collection was facilitated using the Google Forms and MS Forms tools. The findings presented here represent a portion of the data acquired from the survey.

Considering the questionnaire's format, the analyses incorporated the non-parametric U Mann-Whitney statistical test with a significance level at 0.05. Statistical analysis was conducted using R software (R Core Team, 2020) and Rstudio (Rstudio team, 2015).

Results

In the students' assessment, their technical readiness for remote learning notably improved in the second survey (winter 2020/2021) concerning internet connectivity (Figure 1). However, their assessment of the devices used for their coursework

remained relatively consistent between both semesters (summer 2019/2020 and winter 2020/2021), as indicated in Figure 2.

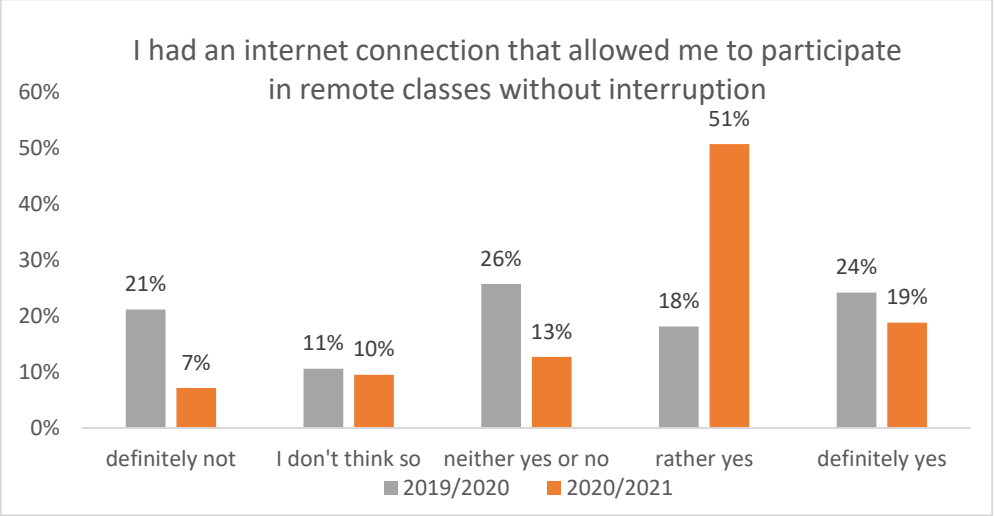


Figure 1: Students opinion about their technical preparation in terms of internet connection (significant difference between semesters) for remote learning.

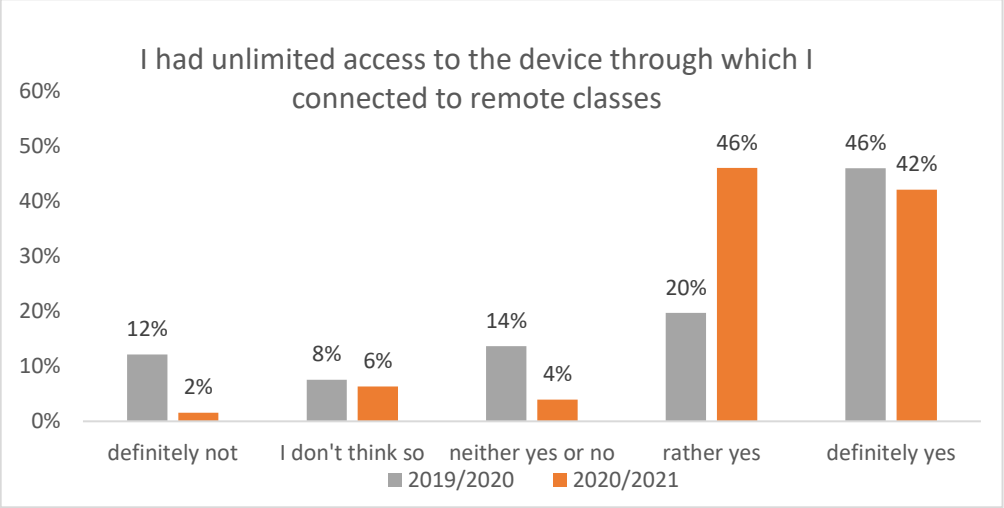


Figure 2: Students opinion about their technical preparation in terms of equipment (no significant difference between semesters), for remote teaching.

After the end of the second semester of remote learning, 68% of students positively and very well evaluated the materials provided by the teachers in terms of their technical quality (formats, file sizes, links, readability of information on the slides), and the possibilities of their use (Figure 3). In addition 55% believed that the materials made it possible to understand the topic of the classes well and very well and to prepare for the exam (Figure 4).

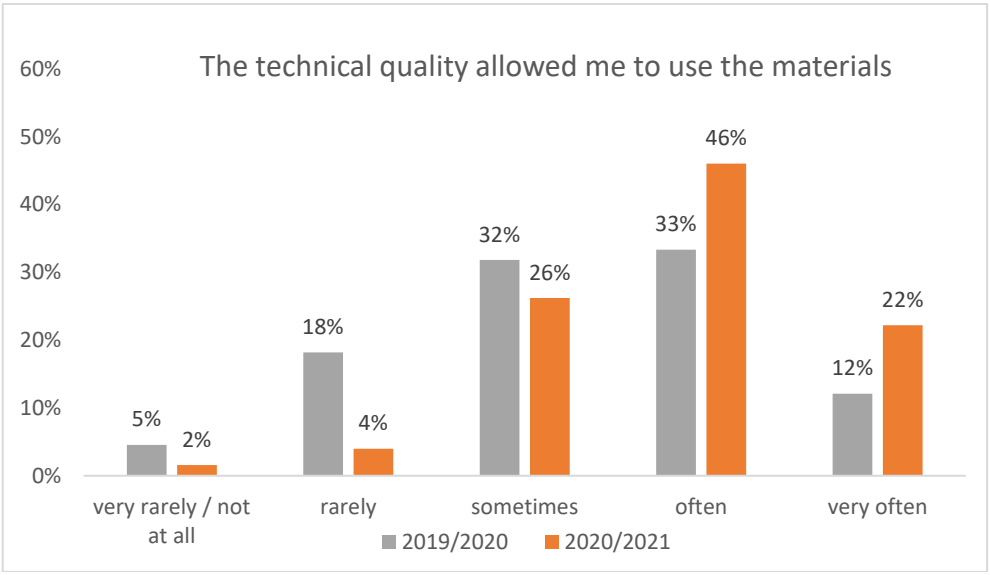


Figure 3: Students opinion about technical quality of teaching materials (significant difference between semesters).

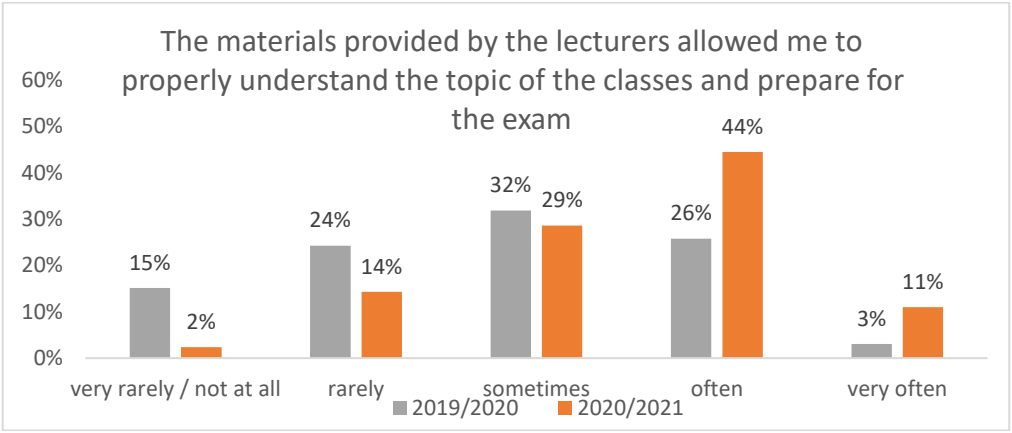


Figure 4: Students opinion about the usefulness of teaching materials (significant difference between semesters).

During the summer semester 2019/2020, 46% of students rated their motivation to study in remote classes as extremely low and low and in the winter semester 2020/2021, this proportion increased to 53% (Figure 5).

During the initial semester of remote classes, only 14% of students rated the effectiveness of remote classes in terms of acquiring knowledge and skills as good and very good. However, in the subsequent semester, this figure increased to 37% (Figure 6).

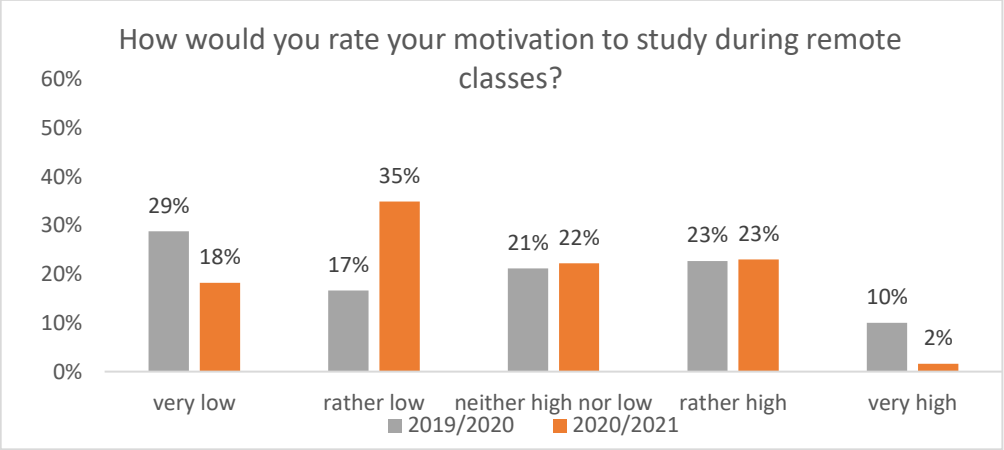


Figure 5: Students' motivation to study during remote classes (no significant difference between semesters).

By examining the responses to the open-ended questions in the survey, it becomes feasible to identify the strengths and weaknesses of remote learning as perceived by students.

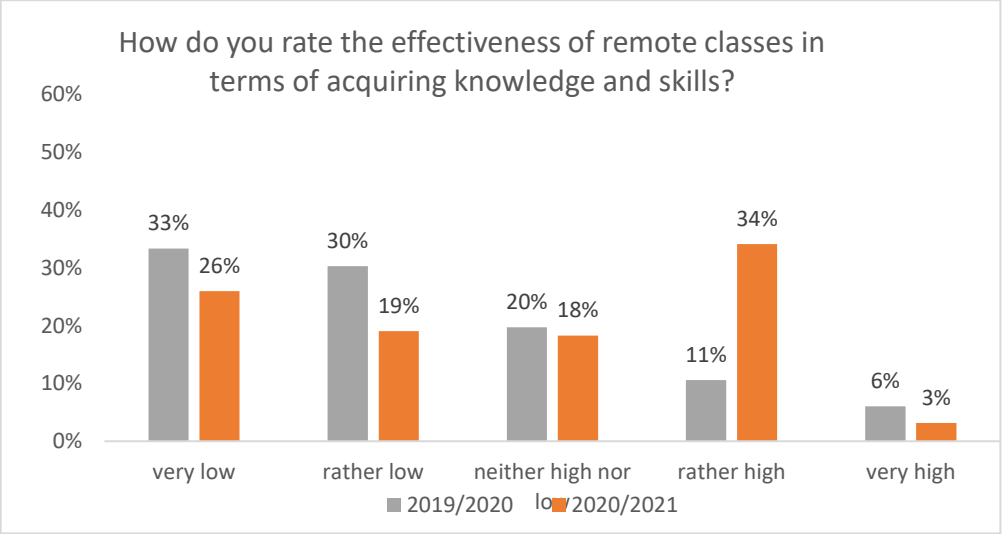


Figure 6: Students' opinions of the effectiveness of remote learning in terms of the acquisition of knowledge and practical skills (significant difference between semesters).

Strengths:

- ability to attend classes despite illness or other factors that hinder physical attendance during face-to-face sessions,
- higher student attendance at lectures,
- improved and more effective note-taking opportunities for students,

- getting high quality teaching materials (e.g. presentations) used during classes,
- access to recorded discussions relevant to the course content, allowing students to play and listen at their own time,
- reduction in costs and time associated with commuting to the university,
- increased flexibility in study schedules, providing greater convenience in completing tasks.

Weaknesses:
- inadequate class quality,
- insufficient number of practical sessions,
- low motivation to learn,
- mental and physical fatigue due to prolonged hours in front of a computer screen, leading to difficulties in concentrating during classes,
- lack of contact with other students and lecturers,
- lack of interaction with other students and lecturers,
- dysfunctionality of platforms used in remote classes, coupled with teachers' inadequately equipped technology, hindering proper understanding of course content.

Discussion

Successful remote teaching hinges upon a fundamental requirement: access to the Internet and providing students with necessary devices for their coursework. The survey results indicate that students of the Faculty of Forestry experienced technical problems while studying during the pandemic. Common complaints included slow Internet speed, signal loss, and malfunctioning platforms utilized during remote classes. Additionally, some students across all Polish universities faced challenges with computer equipment, such as cameras and microphones (Klimkowicz, 2020; Przymuszała *et al.*, 2022). The issues related to devices, Internet connection, and technical glitches were widespread challenges in universities globally during the pandemic (Amir *et al.*, 2020; Katić *et al.*, 2022; Lollobrigida *et al.*, 2022; Masalimova *et al.*, 2022). Notably, these technical problems, particularly regarding the Internet connection, were less pronounced in the winter semester 2020/2021 than in the summer semester 2019/2020.

The main supportive feature of remote learning is diverse array of materials provided by teachers (Şahin, 2021). According to students at the Faculty of Forestry, materials during the second semester of distance learning demonstrated improvements in technical quality - covering formats, file sizes, links, and the readability of slide information - enabling better comprehension of class topics and aiding exam preparation. The ease of access to teaching materials and the flexibility to study at one's convenience emerged as prominent advantages of online learning. Similar feelings were expressed by students from universities in Turkey (Şahin, 2021) and Polish medical universities (Bączek *et al.*, 2021). However, some students

at Polish universities voiced concerns about the overwhelming volume of materials provided by teachers. Students' expectations revolved around material selection, categorization based on specific requirements, and diverse forms of knowledge assessment (Biedroń *et al.*, 2021).

Some authors argue that remote learning lacks adequate motivation (Rodek and Orlińska, 2021; Masalimova *et al.*, 2022). Our research revealed that approximately half of the students experienced low motivation throughout the entire pandemic period. Interestingly, some Polish medical students noted no disparity in their motivation and engagement between remote learning and traditional methods. These students attributed their intrinsic motivation and sense of responsibility toward their future patients (Przymuszała *et al.*, 2022).

Students at the Faculty of Forestry rated the effectiveness of remote learning as low during the pandemic. However, this effectiveness showed improvement in the winter semester of 2020/2021 compared to the previous summer semester. Similar studies also indicate that online learning lacks effectiveness and does not significantly contribute to students' knowledge (Masalimova *et al.*, 2022). Nevertheless, opinions from some Polish and Italian students tend to lean towards average assessments of effectiveness in remote learning (Rodek and Orlińska, 2021; Lollobrigida *et al.*, 2022).

The low assessment of remote learning's effectiveness by forestry students is believed to be a result of limited opportunities to acquire practical skills. Remote learning was considered less effective than face-to face learning in terms of increasing skills (Bączek *et al.*, 2021). In a discipline like forestry, access to physical teaching aids is crucial. This necessitates conducting at least some field and laboratory courses with face-to-face teacher-student contact to ensure comprehensive learning.
Our research, along with studies by other authors, underscores that the absence of personal interactions with teachers and fellow students is one of the primary limitations of remote learning (Amir *et al.*, 2020; Al-Mawee *et al.*, 2021; Rodek and Orlińska, 2021; Mazurek, 2022). Addressing this issue calls for the introduction of novel solutions fostering the establishment of an online academic community among both teachers and students. Diverse forms of engagement can be instrumental, such as informal evening online gatherings aimed at fostering casual interaction, as well as cyclical conversations, allowing for broadening horizons and animating discussions (Klimkowicz, 2020).

The perspectives of forestry students regarding remote learning align with those of students from other universities in Poland and worldwide, highlighting similar advantages and disadvantages, excluding those previously mentioned. The positive aspects of online learning, encompass time and cost savings, as well as the flexibility of learning (Amir *et al.*, 2020; Al-Mawee *et al.*, 2021; Bączek *et al.*, 2021;

Masalimova *et al.*, 2022). Remote learning proves beneficial in enabling the participation of students facing unforeseen circumstances that would otherwise hinder their attendance in classes (Przymuszała *et al.*, 2022).

The prolonged duration of computer work in remote learning has been identified as a risk and negative factor for health problems, both physical and mental (Rodek and Orlińska, 2021; Mazurek, 2022). Polish medical students reported experiencing discomfort such as headaches, back pain, and wrist issues (Przymuszała *et al.*, 2022). Additionally, mental health issues including fear, anxiety, stress, and attention-related problems have been observed (Chakraborty *et al.*, 2021; Katić *et al.*, 2021; Masalimova *et al.*, 2022).

Conclusions

The widespread adoption of remote learning during the Covid pandemic significantly impacted educational practices. According to the Faculty of Forestry students' perspectives, both students and teachers encountered technical challenges, primarily concerning Internet connectivity, hardware, and software, particularly noticeable during the summer semester of 2019/2020. Our findings highlighted numerous advantages of remote learning acknowledged by students. However, despite these benefits, remote learning also poses several limitations. Students expressed grievances about low motivation to learn, insufficient social interaction, health-related issues, and a lack of an adequate number of practical course units.

Absolutely, for disciplines like forestry, providing tangible teaching aids is imperative. This necessitates the implementation of field and laboratory exercises that involve face-to-face teacher-student interaction, at least partially.

The experience gained by both teachers and students during the two semesters of remote courses amid the pandemic has equipped them with valuable insights and readiness to undertake this form of teaching/learning in times of a possible crisis. Now, the focus should shift towards transforming emergency remote teaching/learning into a model that delivers high-quality online education.

Acknowledgements
Research was supported by the POWER project (POWR.03.05.00-00-Z033/17 Success by nature – a comprehensive programme for improving the quality of education process management as well as the quality of teaching at the Warsaw University of Life Sciences, co-funded with the Operational Programme: Knowledge Education Development, Priority axis III Higher education for economy and development, Measure 3.5 Comprehensive Programmes for Higher Education Institutions).

The authors extend their heartfelt thanks to Maciej Pankiewicz PhD together with the students' scientific association Silver.NET, Emilia Paprzycka PhD, DSc, students from the University Council of the Students' Self-Government of the Warsaw University of Life Sciences and Zbigniew Wagner M. Eng. for the preparation of the survey. We would also like to thank Mr. Wojciech Ciechanowski for the initial processing of the survey results.

References

Al-Mawee, W., Kwayu, K.M., Gharaibeh, T., 2021: Student's perspective on distance learning during COVID-19 pandemic: A case study of Western Michigan University, United States. International Journal of Educational Research Open, 2, 100080 https://doi.org/10.1016/j.ijedro.2021.100080

Amir, L.R., Tanti, I., Maharani, D.A., Wimardhani, Y.S., Julia, V., Sulijaya, B., Puspitawati, R., 2020: Student perspective of classroom and distance learning during COVID-19 pandemic in the undergraduate dental study program Universitas Indonesia. BMC Med Educ 20, 392. https://doi.org/10.1186/s12909-020-02312-0

Bączek, M., Zagańczyk-Bączek, M., Szpringer, M., Jaroszyński, A., Wożakowska-Kapłon, B., 2021: Students' perception of online learning during the COVID-19 pandemic: a survey study of Polish medical students. Medicine 100:7(e24821). https://doi.org/10.1097/MD.0000000000024821

Biedroń, M., Mitręga, A., Wawrzak-Chodaczek, M., 2021: Remote learning during the Covid-19 pandemic in the opinion of Polish university students. The New Educational Review ,122-133, https://doi.org/10.15804/tner.2021.64.2.10

Chakraborty, P, Mittal, P, Gupta, MS, Yadav, S, Arora, A. 2021: Opinion of students on online education during the COVID-19 pandemic. Hum Behav & Emerg Tech. 3: 357-365. https://doi.org/10.1002/hbe2.240

Cook, D. A., 2014: The value of online learning and MRI: Finding a niche for expensive technologies. Medical Teacher, 36(11), 965–972. https://doi.org/10.3109/01421 59X.2014.917284.

De Paepe, L., Zhu, C., Depryck, K., 2017: Online Dutch L2 learning in adult education: educators' and providers' viewpoints on needs, advantages and disadvantages, Open Learning: The Journal of Open, Distance and e-Learning, DOI: 10.1080/02680513.2017.1414586

Eom, S.B., and Ashill, N.J., 2018: A system's view of e-learning success model. Decision Sciences Journal of Innovative Education, 16(1), 42-76. https://doi.org/10.1111/dsji.12144

Hodges, C., Moor, S., Lockee, B., Trust, T. and Bond, A., 2020: The difference between emergency remote teaching and online learning. [accessed 21.07.2022], https://er.educause.edu/ articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning.

Katić, S., Ferraro, F.V., Ambra, F.I., Iavarone, M.L., 2021: Distance Learning during the COVID-19 Pandemic. A Comparison between European Countries. Educ. Sci. 11, 595. https://doi.org/10.3390/educsci11100595

Klimkowicz, M., 2020: Polskie uczelnie w czasie pandemii. Project report: SpołTech. Funded by Narodowy Instytut Wolności – Centrum Rozwoju Społeczeństwa Obywatelskiego ze środków Programu Rozwoju Organizacji Obywatelskich na lata 2018-2030. https://centrumcyfrowe.pl/spoltech/.

Lollobrigida, M.; Ottolenghi, L.; Corridore, D.; Pingitore, G.; Damiano, C.; Serafini, G.; De Biase, A. Student Evaluation of Distance Learning during the COVID-19 Pandemic: A Cross-Sectional Survey on Medical, Dental, and Healthcare Students at Sapienza University of Rome. Int. J. Environ. Res. Public Health 2022, 19, 10351. https://doi.org/10.3390/ijerph191610351

Masalimova, A.R., Khvatova, M.A., Chikileva, L.S., Zvyagintseva, E.P., Stepanova, V.V., and Melnik, M.V., 2022: Distance Learning in Higher Education During Covid-19. Front. Educ. 7:822958. doi: 10.3389/feduc.2022.822958

O'Malley, J., H. McCraw, H., 1999: Students perceptions of distance learning, online learning and the traditional classroom. Online Journal of Distance Learning Administration. https://www.semanticscholar.org/paper/Students-Perceptions-of-Distance-Learning,-Online-O%E2%80%99Malley-McCraw/756b65a1f1260b3b45388d4d4cc8fb84b0fc77f6

Ozkan, S., Koseler, R., 2009: Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation, Computers & Education, 53, 1285-1296 https://doi.org/10.1016/j.compedu.2009.06.011.

Przymuszała, P., Zielińska-Tomczak, Ł., Kłos, M., Kowalska, A., Birula, P., Piszczek, M., Cerbin-Koczorowska, M. and Marciniak, R., 2022: Distance Learning and Assessment During the COVID-19 Pandemic—Perspectives of Polish Medical and Healthcare Students. SAGE Open, 12(1). https://doi.org/10.1177/21582440221085016

Radović-Marković, M., 2010: Advantages and disadvantages of e-learning in comparison to traditional form of learning. Annals of the University of Petroşani, Economics, 10(2), 289-298.

R Core Team, 2020: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/

Rodek, V., Orlinska, A., 2021: Adult Students' Attitudes Towards Distance Learning During the SARS-Co-V-2 Virus Pandemic. International Journal of Research in E-Learning, 7(2), 1-13. https://doi.org/10.31261/IJREL.2021.7.2.04

RStudio team, 2015: RStudio: integrated development for R. RStudio Inc., Boston, MA. https://www.r-project.org/conferences/useR-2011/abstracts/180111-allairejj.pdf

Şahin, M., 2021: Opinions of university students on effects of distance learning in Turkey during the Covid-19 pandemic. African Educational Research Journal 9(2), 526-543. https://doi.org/10.30918/AERJ.92.21.082.

Young, A., Norgard, C., 2006: Assessing the quality of online courses from the students' perspective. The Internet and Higher Education, 9(2), 107-115. 10.1016/J.IHEDUC.2006.03.001.

CAN ONLINE LEARNING DELIVER QUALITY HIGHER FORESTRY EDUCATION? A CROSS-CONTINENTAL ANALYSIS

ALEX BIMBO ONATUNJI

Abstract

The year 2020 is unique in recent history with the COVID-19 pandemic and the spread of online teaching methods in universities across the world. The research questions of the paper centre around how online or hybrid teaching technologies are used for higher forestry education during this pandemic, the challenges faced by students and lecturers in the use of digital learning tools, and on the perceived prospects of thee learning technologies beyond the pandemic. To conduct this study, a survey-based approach was used for data collection. Identification and selection of ten universities that are important higher forestry education providers from developed countries (Italy and Spain) and developing countries (Nigeria and Uganda). A structured questionnaire was drafted in the English language, it was reviewed, and a pilot test was carried out. 238 responses were collected between June and August 2022 and analysed descriptively. Over 80% of the responses were from African universities. The proportion of European students who took online classes both before and during the pandemic is higher compared to those of African students, as their universities policies tends more toward face-to-face classes. Inability to go on field trips pose a challenge to both lecturers and students, and replacement with virtual reality field trips garners the lowest interest among the students. On the prospects of digital higher forestry education beyond the COVID-19 pandemic, European students rank introduction of new topics very highly while the African students favour the improvement of soft skills. In conclusion, the results show that online or hybrid training have good prospects in higher forestry education, as they provide new tools and skills for students, and the quality of education delivered is not significantly reduced. The paper recommends that there is a need for universities to take advantage of educational technologies to provide diverse learning options to obtain a forestry degree and encourages a blended approach to learning.

Introduction

The World Health Organization declared the COVID-19 disease a pandemic on 11 March 2020 (WHO, 2020). The risked posed by the virus to public health and the severity and rate with which infections were spreading, forced countries to close their borders and restrict movement by imposing national lockdowns, including at universities across the world (Sobral *et al.*, 2021). As the world grapples with the effects of lockdown on economies and society, the forest sector was also not spared

with respect to these changes. For example, forest dependent livelihoods (jobs) were threatened by the disruptions of international trade (FAO, 2020), and many forest companies in Africa faced financial challenges due to loss of revenue (Attah, 2022). Other studies highlighted the importance of urban forests in providing natural social and psychological support during lockdowns (Stanturf and Mansuy, 2021; Weinbrenner *et al.*, 2021).

The COVID-19 pandemic led to advances and popularisation of digitalization in higher education in many parts of the world, leading toward some scientific publications contributing to the discourse. These include the effectiveness of online learning (Shyju *et al.*, 2021), students' concerns about their future career and professional life (Aristovnik *et al.*, 2020), and the changes experienced by the entire higher education system (Filho *et al.*, 2021), among others. Some studies have also reported innovative teaching methods implemented in higher forestry education from America to Europe due to the COVID-19 pandemic (Dodson and Blinn, 2022; Pirotti *et al.*, 2023; Sokolovskyy *et al.*, 2023; Tereshchenko *et al.*, 2020).

To conduct this study, the following research questions are asked:

- How are online or hybrid teachings carried out by forestry science lecturers during the pandemic?
- What are the challenges faced by students in learning and by teachers in teaching during the pandemic?
- What are the perceived prospects of online teaching and learning of forestry science after the COVID-19 pandemic?

Data for this study were collected through a survey of forestry students and lecturers in two developing countries in Africa and two developed countries in Europe. Nigeria and Uganda are the two countries selected in Africa, while Italy and Spain were chosen in Europe. The four selected countries are important forest countries, and the selection was influenced by countries and institutions where the author has contacts and would be able to stimulate responses.

The purpose of higher forestry education is to help train individuals to become experts in managing and utilizing forests for the betterment of society at large (Jegatheswaran *et al.*, 2018). For example, through its contribution to the achievement of the Sustainable Development Goals (Kanowski, 2020). This paper thus offers a fresh perspective based on a study carried out on the impact of the COVID-19 pandemic in online teaching and learning of forestry science in Africa and Europe.

Methods

Based on the objectives of this study, a survey-based approach was appropriate to collect responses about the perception of forestry students and lecturers of digital education in relation to COVID-19 pandemic (Pirotti *et al.*, 2023).

- First, an online search to generate the name and year of establishment of universities offering forestry education in the selected countries was conducted. Nigeria as a country offers forestry degree programmes in 41 universities, followed by twelve in Spain, eleven in Italy and two in Uganda. This makes a total of 66 universities in the four countries offering a forestry degree. The convenience sampling method (Masiero *et al.*, 2020) is used to select ten universities that are important higher forestry education providers and where the author has contacts in the selected countries, to elucidate responses.
- Second, a structured questionnaire was drafted in English, with insights from similar and related studies (Dodson and Blinn, 2021, 2022). It consisted of open, close-ended, multiple choice and rating-scale (5 levels) questions. Open ended questions gave the respondents the possibility of sharing their opinions, comments and experiences. Furthermore, the questions asked were organized into five sections. They include:
  - Section A: Perspective on online teaching before and during the COVID-19 pandemic,
  - Section B: Challenges faced by forestry lecturers and students during the COVID-19 pandemic, and how they communicated the challenges to their universities,
  - Section C: Prospects of online learning of forest sciences after the COVID-19 pandemic,
  - Section D: Looking beyond teaching and learning forest science in the COVID-19 pandemic era,
  - Section E: Background information and demographic characteristics of the respondents.
- Third, the drafted questionnaire was given to the thesis (Box 1) supervisors who provided a detailed review on the content, context, and grammar. The questionnaire was then converted into an online survey using a free and open-source data collection platform known as Kobotoolbox (www.kobotoolbox.org), which can collect online and offline data and be analysed as soon as the data are collected (Babalola and Onatunji, 2018). A pilot test of the questionnaire was conducted, receiving responses from ten lecturers and fifteen students. Feedback received has been incorporated into the questionnaires before the final deployment.
- Fourth, the data were collected between June and August 2022, by sharing the link to the questionnaire through students, student coordinators, lecturers, and department heads via email and WhatsApp. The project supervisors also

distributed the questionnaire in their network. Follow up reminders were sent, especially to the European target audience due to the small number of responses received from European Universities. The respondents also agreed to a General Data Protection Regulation (GDPR) data privacy notice, and with the new *"Code for the Integrity of the Research"* approved by the University of Padova allowing the analysis of the data collected. Some challenges were experienced during the data collection by the author. For example, the author does not have direct access to many of the forest students in the European universities, so he had to rely mostly on a third party (teachers) to help distribute the information to the students. Also, due to time and economic constraints, this survey was administered only in English and not translated into local languages; and it was not supplemented with a hardcopy questionnaire available in some other European studies such as in Masiero *et al.*, (2020).

- Fifth, the digital data collection platform used for the study was designed in such a way that it does not allow the submission of incomplete questionnaire responses, so that all the 238 collected were successfully completed and analysed. Microsoft 365 Excel was used to collect descriptive information on universities that offer forestry programmes in the selected countries and was used to analyse the data collected from the survey. The responses from European countries were included in the analysis despite representing less than 20% of the total data collected because they are important results in social research such as this. Also, the data from the two continents are compared by proportion and mean, and not by absolute value. Furthermore, Box 1 provides the experience and perspective of the author.

Results

Demographic information[3]

Figure 1 shows the responses received per countries surveyed. Nigeria led with the highest number of respondents of students (162) and lecturers (10). There are numerous responses from Nigeria (72.3% of all responses), compared to other countries represented in the survey. This is followed by Italy with 24 responses from students and 8 lecturers. The responses from European countries were included in the analysis despite representing less than 20% of the total data collected because they are important results in social research such as this, and comparison are made in percentage. More than half (56.7%) of the respondents were between 18 and 24 years. There were more male (59.7%) than female (40.0%) students who responded to the survey. Most African students (92.2%) were pursuing their Bachelor's degree, while 85.7% of the European students were seeking their Master's degree.

[3] In the result section, AU means responses from the Africa Universities, while EU means responses from the European Universities.

Box 1: Authors personal experience during MSc.
The author's study in Europe was the Erasmus Mundus Master Programme in Mediterranean Forestry and Natural Resources Management (MEDfOR, https://medfor.eu/). The programme is a two-year renown international programme in the field of Forestry and Sustainability, implemented in 2012, and it is offered by a consortium of seven universities in Italy, Poland, Spain and Turkey (Tavares and Borges, 2021). The total number of students enrolled in the programme in 2020 was much lower than in previous years, due to the COVID-19 pandemic[4]. The lectures were organized in a mixed mode, online and face-to-face (in hybrid format). One advantage of this arrangement is the invitation of over 15 external lecturers and experts from universities and other institutions around the world invited to teach about specific topics and even a full course at the University of Lleida, Spain (author's first year of study). These classes enriched the students' learning with current topics of interest such as forests and human health, and students learned about other forests from the comfort of their rooms. Field trips were organized in a safe manner, after local travel bans were lifted by the universities. The trips were to different forest-related organizations, companies, research institutes and private forests, among others, to expose the students to the world of Mediterranean forestry in a country such as Spain. Conferences were also organized, after taking a course on science communication. The author also volunteered through the International Forestry Students Association (IFSA) as the coordinator of the Joint IUFRO-IFSA Task Force on Forest Education (2020-2021), and head of Forest Europe Subcommission (2021-2022). This led to the publication of a book titled "Building a Successful Forestry Career in Africa: Inspirational Stories and Opportunities" (Onatunji ***et al.*** , 2021). The book project was supported and funded by IFSA, the IUFRO Special Programme for Development of Capacities, and the Joint IUFRO-IFSA Task Force on Forest Education. Furthermore, as a *"Dare to Explore"* trainee (https://ifsa.net/efi-ifsa-iufro-project/dare-to-explore/), the author worked with the European Forest Institute, Bonn, Germany. Through remote working, he contributed to two funded projects and to event planning. Thus, building research and scientific skills, and bridging the gap between the theoretical knowledge he learned at university and the practical world of work. The author's personal experiences inspired him to conduct his Master's thesis reach on the nexus between higher forestry education and online learning (Onatunji, 2022).

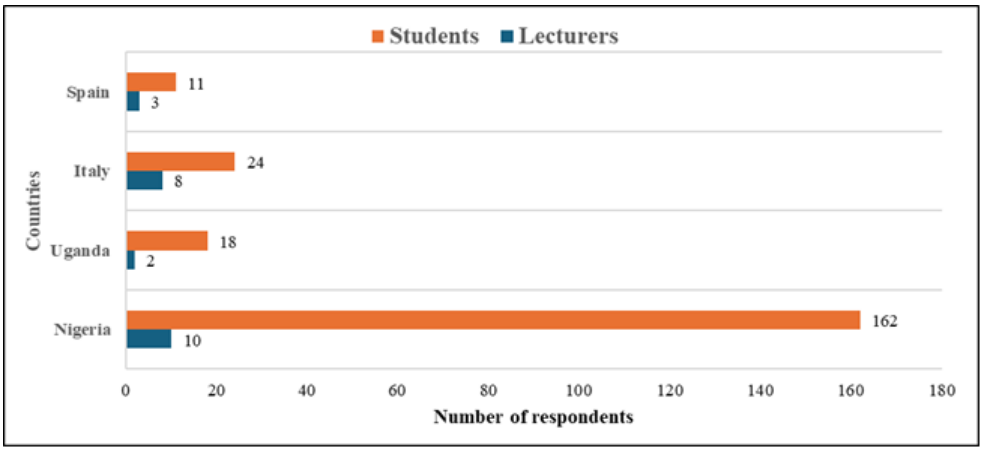


Figure 1: Respondents per country.

[4] There were only ten students in this cohort, of which only two came from outside the European Union, unlike other cohorts, both before and after (see: https://medfor.eu/edition/9th-edition-20202022).

Studying forestry in Africa and Europe amid the COVID-19 pandemic

Figure 2 shows that the use of online teaching for forestry science courses before the COVID-19 pandemic is extremely low, compared to during the pandemic. On the question about the usage of online teaching for forestry classes during the COVID-19 pandemic, a wide margin was observed in the proportion of Africa students (52.3%) reporting positively compared to responses from Africa lecturers (92.1%) on the same question. The responses from the European students (85.7%) are much closer to the European lecturers (100.0%). Continent wise, the proportion of African students who took online classes both before and during the pandemic is lower compared to those of European students.

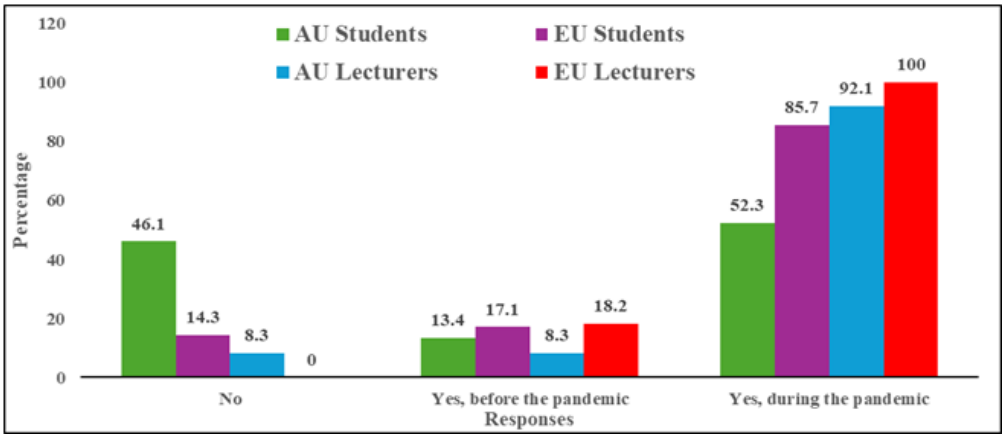


Figure 2: The adoption of online learning and teaching in all the courses of the forestry science programmes (all levels). Students (respondents = n = 215) and lecturers (respondents = n = 23).

A mixed method of learning

The results in Figure 3 show the institution arrangements or policies in place during the COVID-19 pandemic at the universities surveyed as reported by the lecturers. European universities are more accepting the idea of teaching a full course being taught online (38.6%), and a full degree programme online (36.4%) policy-wise. The African universities policies only favour limited use of online teaching mode as only 50% or less than 25% of a course can be taught online (22.7%).

Practicalities in organizing online lectures and field trips during the COVID-19 pandemic

The use of video tools is imperative for the delivering of online or hybrid lectures before or during the pandemic (Figure 4). Zoom topped the list of platform usage in the selected African (96.3%) and European countries (70.7%). This is followed by Google Meet with 75.9% of African students using it, and 43.9% of their European colleagues. The Blackboard Collaborate is also popular in both African (50.0%) and European universities (51.2%). Of note is that the use of pre-recorded lectures is more popular among the African universities (50.0%) compared to their European colleagues (24.4%).

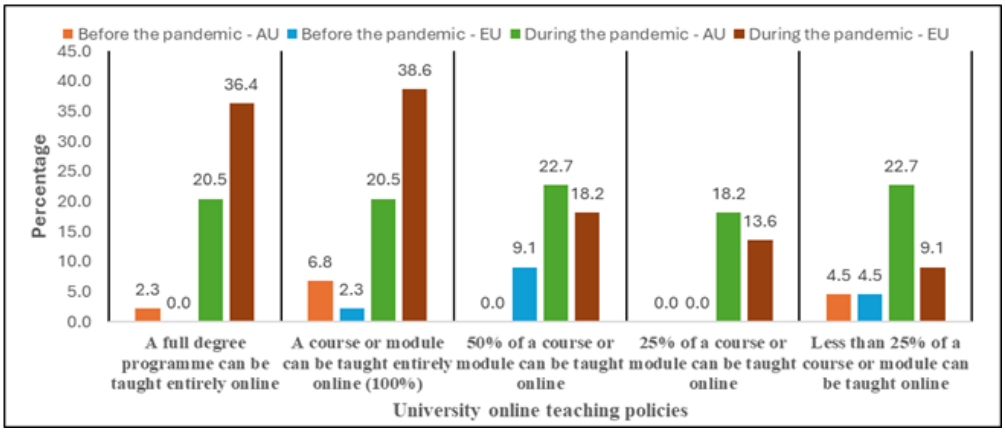


Figure 3: Policies on teaching forestry science online adopted by universities before and during the pandemic as reported by teachers (respondents = n = 22).

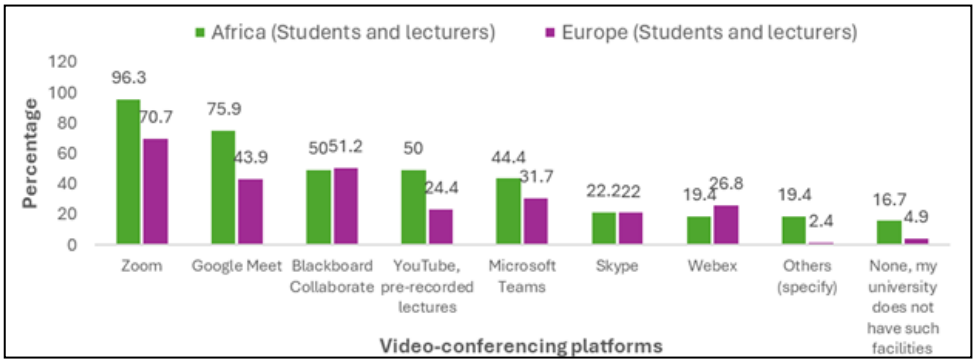


Figure 4: Platforms universities used for online video lectures before or during the pandemic or both for forestry sciences programmes (respondents n = 149). Note: This graph is based on the summation on the percentage of responses for the use of listed platforms for before the pandemic, during the pandemic, and both.

Figure 5: The author (right) with colleagues during a field trip as part of the Winter School programme at the University of Valladolid, Palencia, Spain. Photo: Pilar Valbuena.

Field trips were difficult to organize during the COVID-19 pandemic, especially due to travel and gathering restrictions. The results from the survey show that missing field trips (mean = 4.27) ranks first among European students and second among their African colleagues as regards challenges that they face during online learning:

- *"Forest sciences learning a lot to do with field work, which I believe was greatly negatively affected during the pandemic era"* – Bachelor Forestry and Wildlife student, Nigeria.
- *Cross-learning opportunities for students and the downside of online learning in higher forestry education*

Table 1: Perception of students of the prospects of online forestry science learning on a 5-point Likert scale. Total Likert scale calculation (TLC). The Likert scale used were Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1). n = 215 (AU = 180; and EU = 35).

S/N	Prospects of online learning (students)	AU		EU		Grand total		
		Mean	Rank	Mean	Rank	TLC	Mean	Rank
1	Improve soft skills such as collaboration, working in a team, use of ICT tools etc.	4.05	**1st**	3.29	**3rd**	844	3.93	**1st**
2	Opportunity to combine studies and work	3.92	**2nd**	2.57	6th	796	3.70	**2nd**
3	Opportunity to participate in more extracurricular activities	3.87	**3rd**	2.51	7th	784	3.65	**3rd**
4	Introduction of new and emerging topics such as Greencare, forest and human health, etc.	3.66	4th	3.60	**1st**	784	3.65	**3rd**
5	Flexibility of study hours	3.17	5th	3.34	**2nd**	687	3.20	5th
6	Preference of online teaching/learning platforms to face-to-face only because of students' abilities to collaborate with peers at other universities and locations	2.66	7th	2.91	4th	581	2.70	6th
7	Opportunity to avoid professors which students have a negative relationship with	2.79	6th	2.14	8th	578	2.69	7th
8	The opportunity to invite guest lecturers or experts from other universities/institutions	2.63	8th	2.80	5th	572	2.66	8th
9	Prefers virtual reality (VR)/online teaching to replace some fieldwork	2.54	9th	1.71	9th	517	2.40	9th

There is a remarkable difference in the ranking provided by students in Africa and Europe on their perception about the prospects of online forestry science learning (see Table 1). Introduction of new and emerging topics such as Green Health Care, forest and human health, etc. ranks topmost for the European students but 4th for their African colleagues. Improvement of soft skills ranks topmost for the Africa students and 3rd for their European colleagues. Interestingly, both Africa and

European students ranks preference of virtual reality (VR)/online teaching to replace some fieldwork the lowest (9th).

The overall perception of advantages of teaching and learning higher forestry education online during the COVID-19 pandemic era by the lecturers and students were mixed, with both positive and negative experiences mentioned in the survey. Some of the comments given by the students are:

- *"Learning forestry took a big shift as it exposed me to opportunities outside my university and home country and also gave me access to new knowledge and how Forest science is related to the pandemic"* – Bachelor Forestry and Wood Technology student, Nigeria 2.
- *"Teaching and learning facilities for me as a forestry student becomes limited because, for me, online classes are just formalities"* – Bachelor Forestry and Wildlife student, Nigeria.
- *"The pandemic affects my classes and internship which makes me miss the opportunity to learn outside the classroom"* – Bachelor Forestry and Wildlife student, Nigeria.

Discussion

Demographic information

The responses from Nigeria represented a great proportion of the survey. The number of responses received cannot be used to gauge the number of students studying for a forestry degree programme in the selected universities. For instance, while only sixteen students from the University of Padova responded to this survey, 248 Bachelors and Masters forestry students responded to another study led by three professors at the same university (Pirotti *et al.*, 2023). Thus, students seems to respond better to surveys led by their professors. This phenomenon was also evident in a global survey attracting only 118 students in Europe (Rekola *et al.*, 2024) while a European focused study received 1368 student responses (Masiero *et al.*, 2020). Furthermore, beyond the national diversity of students enrolled in an international study programme, there is also a need for the integration of a diversity of professionals from other countries in the teaching of forestry as all lecturers who responded to the survey are nationals of the respective countries where the universities are located (Gabay and Rekola, 2019).

Learning forestry in Africa and Europe amid the COVID-19 pandemic

The proportion of African students who took online classes both before and during the pandemic is lower compared to those of European students. One possible reason for this is that lockdown measures are more stringent in Europe (Sobral *et al.*, 2021), and African universities were less prepared to transition to online teaching (Abosede *et al.*, 2021). Delivering higher forestry education in on line form was pioneered about two decades ago, with earliest documented examples from Germany and South Africa (Längin *et al.*, 2004). Today, many universities have embraced this

technology to deliver forestry education from small to large scale deployments (Dodson and Blinn, 2022; Pirotti *et al.*, 2023; Shrestha *et al.*, 2022).

Unsurprisingly, the African universities policies only favour limited use of online teaching mode compared to their European counterparts who were able to quickly adapt their teaching online. In fact, there are limited studies on this topic from the Africa continent while many studies have been published in Europe and other developed countries (Mushkarova *et al.*, 2020; Pirotti *et al.*, 2023; Sokolovskyy *et al.*, 2023). More efforts and support are needed to enable African universities to fully benefit from the transition to delivering quality digital education, especially in forestry degree programmes (Kachaka and Nkwinkwa, 2020; Katsvanga and Mudyiwa, 2019; Kung'u *et al.*, 2021).

The administrations of the universities should take advantage of educational technology to provide diverse learning options to obtain a forestry degree and encourage a blended approach to learning. Future forestry curricula should be flexible to allow easy changes to topics to be taught to students. If well managed, online learning can be more beneficial to the long-term career goal, reducing the cost of tuition and being more attractive to young people than traditional learning. Research has shown that these teaching technologies are promising to use (Culbert, 2021; de Jong *et al.*, 2021).

Practicalities in organizing online lectures and field trips during the COVID-19 pandemic

Forestry lecturers and students often recourse to online video (such as Zoom and Google Meet) and course management platforms (such as Moodle and Virtual Campus) provided by their universities as they have been found to be sufficient and effective (Makruf *et al.*, 2022; Ratnasingam *et al.*, 2020). Beyond synchronized use of teaching platforms, forestry students have been found to highly prefer recorded classes to online classes if given a choice (Pirotti *et al.*, 2023).

Expectedly, field trips were difficult to organize during the pandemic, especially due to travel and gathering restrictions. Missing field trips ranks very high among the forestry students both in African and European countries as challenges that they face during online learning of higher forestry education. Similar observations have been reported by Pirotti *et al.*, (2023) among forestry students from the University of Padua, Italy. Online education of forestry students without field experience and personal interactions have been found to be insufficient in achieving the study objectives. This is because students prefer face-to-face classes and field trips for technical courses such as forests operation (Dodson and Blinn, 2022), and field trips can also shape students career decisions (EFI *et al.*, 2022). On the bright side, supplementing field trips with videos have been found to be very promising among students, with a forestry professor videos gathering over 43,000 views online (Culbert, 2020).

Cross-learning opportunities for students and the downside of online learning in higher forestry education

The wide usage of online classes for forestry programmes because of the COVID-19 pandemic has its own merit and demerit. These merits and demerits depend on whom you ask, and what perspectives the responses come from, such as cost of attending universities, general availability of recorded lectures, and the costs and time of lecturers involved in adapting these courses from face-to-face only to fully online or hybrid models. The European students appreciate the introduction of new and emerging topics such as Green Health Care, forest and human health, etc. because it could lead to more diverse career opportunities after graduation, especially in the green jobs and bioeconomy sectors (Da Silva and Schweinle, 2022; EFI *et al.*, 2022). African students on the other hand highlighted that improving their soft skills concerning collaboration, working in a team, and use of ICT tools etc. is much more appreciated. Very important skills that have been found that forestry graduates should possess are social skills that allow them to work with a myriad of experts and stakeholders as they manage the world forests (Rekola *et al.*, 2024).

Both, lecturers and students, experienced some challenges using online learning and teaching methods for forestry classes. Adapting face-to-face class to online classes comes with enormous work for lecturers who have to quickly adapt the changes, change their evaluations methods sometimes and still carry out other activities to support the students (Barton, 2020). Students' unwillingness to use their camera during online video classes is an example of problems lecturers had to deal with (Bedenlier *et al.*, 2021).

Students, on the other hand, have also been stressed by many factors such as difficulties in following technical learning topics online like Global Information Systems and Remote Sensing, and Data Analysis; increased screen time on computers leading to fatigue, the need for self-motivation and to be more disciplined, as learning online comes with distractions. The challenges are not unique to forestry students, they have also been reported in other fields (Biyiri and Dissanayake, 2021; Filho *et al.*, 2021; Ratnasingam *et al.*, 2020).

Conclusion

Assumptions and limitations

Despite the rigorous scientific procedure that was followed in carrying out this study, there were still some limitations:

- The selected countries did not represent the entire situation on the two chosen continents, and the chosen universities may not describe the whole situation in each country.

- Due to the peculiarity of an online survey and data collection, the level of responsiveness and the number of responses may not entirely represent the real situations.
- Comparisons across countries and continents will not be perfect due to inherent differences in academic administrations, systems/structure, and policies in each country.
- Due to funding and travel limits, the researcher had to solely rely on online data collection, without the opportunity to verify information by other methods.
- The most relevant limitation may be that the number of universities surveyed is quite small. Nevertheless, some tentative conclusions or perhaps better indications can be drawn.

Conclusions

Despite the COVID-19 pandemic, the usage of online technology for teaching forestry students in Africa is much lower than in Europe. Universities in Europe were more prepared for such deployments as they already have institutional ability and flexibility to do so. Universities in Africa do not have the technology to quickly deploy such tools and university policies still predominately favours face-to-face classes than online classes. Moreover, research studies on the topic of digitalizing higher forestry education should be led by lecturers, as students are more likely to respond to such survey.

The Zoom and Google Meet video conferencing platforms are popular in both continents and can be used to deploy cross-country and cross-continent education to forestry students. In fact, digital exchange of forestry students and lecturers can be promoted using these technologies to the benefits of the students who will be able to collaborate with their peers abroad and learn topics that might be available in their own universities.

The overall perspective of learning and teaching forestry in the COVID-19 pandemic era is more negative for the forestry students, while mixed experienced for the lecturers. The reduction in face-to-face and field activities makes the European forestry students and lecturers feel that the quality of forestry education provided during the COVID-19 pandemic was compromised much more than their African counterparts felt. Furthermore, forestry curricula at universities should be flexible in topics, teaching, and assessment methods, to accommodate a hybrid learning environment.

As the universities care much more about students than the lecturers who teach them, most research was focused on delivering quality education to students and limited research have been carried out on the perspectives and experiences of the lecturers. Thus, it is recommended that universities care more about the lecturers and their working conditions. Ultimately, they should provide forestry lecturers with training on digital teaching technologies and provide incentives to use them.

Now that it has been over five years since the roll out of digital teaching methods in higher forestry education, more studies need to be carried out to know how universities have permanently adopted this technologies, perspectives of forestry graduates and employers on skills match or gaps that have emerged because of the COVID-19 pandemic effect on the forestry sector.

Acknowledgements
The author thanks the 238 respondents to the survey. He is grateful to have been allowed to be part of the ninth edition of MEDFOR, a cohort of ten students from seven countries. He acknowledges the funding received towards his education, Grants for International Students, University of Lleida, Spain, for the first year, and the Veneto Regional Scholarship University of Padova, Italy, for the second year of study. He appreciates the European Forest Institute, Germany, for the paid traineeship opportunities. He also appreciates the support received from his lecturers, thesis supervisors, administrative staff, friends, wife, and family, without whom this educational attainment would have been impossible. Special thanks to the anonymous reviewer, Antonio Basilicata, and Pieter Schmidt for comments that helped improve the quality of this paper.

References

Abosede, C., Oresajo, O. and Akintola, O. (2021). COVID-19 and Higher Education in Nigeria: The Present and the Future. Interdisciplinary Journal of Education, 4(2), 100–113. https://doi.org/10.53449/ije.v4i2.59

Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N. and Umek, L. (2020). Impacts of the COVID-19 Pandemic on Life of Higher Education Students: A Global Perspective. Sustainability, 12(20), 8438. https://doi.org/10.3390/su12208438

Attah, A. N. (2022). Second Assessment of the Impact of COVID-19 on Forests and Forest Sector in the Africa Region.

Babalola, F. D., and Onatunji, A. B. (2018). Assessment of Factors Responsible for Diploma Students' Decision to Study Forestry. In A. O. Akinwole, V. A. J. Adekunle, and O. Y. Ogunsanwo (Eds.), Emerging Issues in Sustainable Forest Management: Experiences and Lessons for Nigeria (pp. 62–68). Forestry Association of Nigeria.

Barton, D. C. (2020). Impacts of the COVID-19 pandemic on field instruction and remote teaching alternatives: Results from a survey of instructors. Ecology and Evolution, 10(22), 12499–12507. https://doi.org/10.1002/ece3.6628

Bedenlier, S., Wunder, I., Gläser-Zikuda, M., Kammerl, R., Kopp, B., Ziegler, A. and Händel, M. (2021). "Generation invisible? Higher Education Students' (Non)Use of Webcams in Synchronous Online Learning. International Journal of Educational Research Open, 2(October), 100068. https://doi.org/10.1016/j.ijedro.2021.100068

Biyiri, E. W. and Dissanayake, D. M. M. I. (2021). A Study on Satisfaction towards the Online Learning among the Tourism and Hospitality Management Students during the Covid 19 Pandemic. Journal of Management and Tourism Research, 4(1), 37–57.

Culbert, P. D. (2020). Supplementing forestry field instruction with video and online dynamic quizzing. Natural Sciences Education, 49(1), 1–12. https://doi.org/10.1002/nse2.20015

Culbert, P. D. (2021). COVID-19 field instruction: Bringing the forests of British Columbia to students 8,000 km away. Natural Sciences Education, 50(1), 1–13. https://doi.org/10.1002/nse2.20040

Da Silva, E. J. and Schweinle, J. (2022). Green Jobs in the Pan-European Forest Sector. http://www.thuenen.de

de Jong, W., Huang, K., Zhuo, Y., Kleine, M., Wang, G., Liu, W. and Xu, G. (2021). A Comparison of Forestry Continuing Education Academic Degree Programs. Forests, 12(824), 1–17. https://doi.org/10.3390/f12070824

Dodson, E. M. and Blinn, C. R. (2021). Forest operations instructor and student perspectives on rapid transition from face-to-face to online learning in the US. International Journal of Forest Engineering, 33(1), 2–11. https://doi.org/10.1080/14942119.2021.1907109

Dodson, E. M. and Blinn, C. R. (2022). How will COVID-19 Change Forestry Education? A Study of US Forest Operations Instructors. Journal of Forestry, 120(2), 145–155. https://doi.org/10.1093/jofore/fvab050

EFI, IFSA and IUFRO. (2022). What do universities offering forest-related programmes need to know about forest-related education and employment? (p. 3). European Forest Institute. https://ifsa.net/wp-content/uploads/2022/04/Factsheets-Universities.pdf

FAO. (2020). The Impacts of COVID-19 on the forest sector: How to respond? In Policy Brief. FAO. https://doi.org/10.4060/ca8844en

Filho, W. L., Price, E., Wall, T., Shiel, C., Azeiteiro, U. M., Mifsud, M., Brandli, L., Farinha, C. S., Caeiro, S., Salvia, A. L., Vasconcelos, C. R., de Sousa, L. O., Pace, P., Doni, F., Veiga Avila, L., Fritzen, B. and LeVasseur, T. J. (2021). COVID-19: the impact of a global crisis on sustainable development teaching. Environment, Development and Sustainability, 23(8), 11257–11278. https://doi.org/10.1007/s10668-020-01107-z

Gabay, M. and Rekola, M. (2019). Forests, peaceful and inclusive societies, reduced inequality, education, and inclusive institutions at all levels United Nations Forum on Forests (Background Study Prepared for the Fourteenth Session of the United Nations Forum on Forests, Issue c). https://www.un.org/esa/forests/wp-content/uploads/2019/03/UNFF14-BkgdStudy-SDG4-10-16-March2019.pdf

Jegatheswaran, R., Florin, I., Hazirah, A. L., Shukri, M., Latib, A. S. and Latib, S. A. (2018). Transforming forest education to meet the changing demands for professionals. Journal of Tropical Forest Science, 30(5), 431–438. https://doi.org/10.26525/jtfs2018.30.5.431438

Kachaka, C. and Nkwinkwa, D. (2020). Teaching at the heart of SFM: A regional-scale ITTO project has boosted forestry education in the Congo Basin. In ITTO Tropical Forest Update 29/1. https://www.itto.int/direct/topics/topics_pdf_download/topics_id=6430andno=1anddisp=inline

Kanowski, P. J. (2020). Multilateral forestry research and tertiary forestry education for development: reflections on progress since the 1970s. International Forestry Review, 22(1), 113–128. https://doi.org/10.1505/146554820829523961

Katsvanga, C. A. and Mudyiwa, S. M. (2019). Training needs analysis and forestry curricula evaluation in professional and technical institutions in Sub-Sahara Anglophone countries (175; AFF Working Paper). https://afforum.org/wp-content/uploads/2020/07/Vol-4-Issue-2-English.pdf

Kung'u, J. B., Muchiri, B. K. and Kuria, A. (2021). Regional Assessment of Forest Education in Africa. https://www.fao.org/3/cb6733en/cb6733en.pdf

Längin, D. W. W., Ackerman, P. A. A. and Lewark, S. (2004). Internet-based learning in higher forestry education. Unasylva, 55(216), 39–44.

Makruf, I., Rifa'i, A. A. and Triana, Y. (2022). Moodle-based online learning management in higher education. International Journal of Instruction, 15(1), 135–152. https://doi.org/10.29333/iji.2022.1518a

Masiero, M., Secco, L., Pettenella, D., Da Re, R., Bernö, H., Carreira, A., Dobrovolsky, A., Giertlieova, B., Giurca, A., Holmgren, S., Mark-Herbert, C., Navrátilová, L., Pülzl, H., Ranacher, L., Salvalaggio, A., Sergent, A., Sopanen, J., Stelzer, C., Stetter, T., … Wallin, I. (2020). Bioeconomy perception by future stakeholders: Hearing from European forestry students. Ambio, 49(12), 1925–1942. https://doi.org/10.1007/s13280-020-01376-y

Mushkarova, O., Mikheeva, M., Tereshchenko, S., Panyutin, A. and Kuznetsov, E. (2020). Increasing the efficiency of the use of forest resources by the digitalization of forest education. IOP Conference Series: Earth and Environmental Science, 574(1), 012054. https://doi.org/10.1088/1755-1315/574/1/012054

Onatunji, A. B. (2022). Impacts of COVID-19 Pandemic on teaching and learning Forest Science in Africa and Europe: Lessons learned from case studies [University of Padova, Italy]. http://hdl.handle.net/20.500.12608/37158

Onatunji, A. B., Owuor, J. A., Rodriguez-Piñeros, S., Babalola, F. D., Akello, S. and Adeyemi, O. (2021). Building a Successful Forestry Career in Africa: Inspirational Stories and Opportunities. International Union of Forest Research Organizations. https://www.iufro.org/fileadmin/material/publications/joint-publications/building-a-successful-forestry-career-in-africa.pdf

Pirotti, F., Anfodillo, T. and Gatto, P. (2023). Shaping the Forced Change to Online Teaching Towards a Digital Future: What Are the Disadvantages in Forestry Higher Education? In P. Schmidt, S. Lewark and N. Weber (Eds.), Digitalization in Higher Forestry Education: Teaching and Learning Revisited. Proceedings of the SILVA Network Conference held at the Department of Forest Sciences, Technische Universität Dresden, Tharandt, Germany. (pp. 44–

53). SILVA Network. https://ica-silva.eu/images/Proceedings/2023_SILVAConverenceProceedingsNo18_Dresden2021_Text.pdf

Ratnasingam, J., Jegathesan, N., Ab Latib, H., Yi, L. Y., Mariapan, M., Ioras, F. and Abdul Azim, A. A. (2020). Effectiveness of online teaching and learning of wood science and technology courses during the COVID-19 pandemic: Early evidences from a survey of Malaysian universities. BioResources, 16(1), 403–416. https://doi.org/10.15376/biores.16.1.403-416

Rekola, M., Taber, A. B., Sharik, T. L., Parrotta, J. A., Dockry, M. J., Babalola, F. D., Bal, T. L., Ganz, D., Gruca, M., Guariguata, M. R., Kungu, J., Larasatie, P., Nevgi, A., Rodriguez-Piñeros, S., Saengcharnchai, S., Sandström, N. and Walji, K. (2024). Social and knowledge diversity in forest education: Vital for the world's forests. Ambio. https://doi.org/10.1007/s13280-024-02104-6

Shrestha, A., Crawford, J. and Chen, H. (2022). Delivering forestry courses online: experiences, lessons learned, and future of forestry online education in the Asia Pacific. Journal of Forestry Research. https://doi.org/10.1007/s11676-022-01555-5

Shyju, P. J. J., Vinodan, A., Sadekar, P., Sethu, M. and Lama, R. (2021). Determinants of online learning efficacy and satisfaction of tourism and hospitality management students during the COVID-19 pandemic. Journal of Teaching in Travel and Tourism, 21(4), 403–427. https://doi.org/10.1080/15313220.2021.1998941

Sobral, S. R., Jesus-Silva, N., Cardoso, A. and Moreira, F. (2021). EU27 Higher Education Institutions and COVID-19, Year 2020. International Journal of Environmental Research and Public Health, 18(11), 5963. https://doi.org/10.3390/ijerph18115963

Sokolovskyy, Y., Lavnyy, V., Storozhuk, O. and Sinkevych, O. (2023). Application of Modern Information and Communication Technologies to Create a Virtual Learning Environment at the Ukrainian National Forestry University. In P. Schmidt, S. Lewark, and N. Weber (Eds.), Digitalization in Higher Forestry Education: Teaching and Learning Revisited. Proceedings of the SILVA Network Conference held at the Department of Forest Sciences, Technische Universität Dresden, Tharandt, Germany. (pp. 13–23). SILVA Network. https://ica-silva.eu/images/Proceedings/2023_SILVAConverenceProceedingsNo18_Dresden2021_Text.pdf

Stanturf, J. A. and Mansuy, N. (2021). COVID-19 and Forests in Canada and the United States: Initial Assessment and Beyond. Frontiers in Forests and Global Change, 4(July), 1–16. https://doi.org/10.3389/ffgc.2021.666960

Tavares, C. and Borges, J. G. (2021). MEDFOR: The Experience of an Erasmus Mundus Master Programme in Forestry and Natural Resources. In P. Schmidt, S. Lewark, and N. Weber (Eds.), Twenty years after the Bologna declaration – Challenges for higher forestry education June 19 - 21, 2019. (pp. 57–65). SILVA Network on Forest Education. https://ica-silva.eu/

Tereshchenko, S., Zagorskaya, M., Polyanskaya, O. and Bobritskaya, J. (2020). Mobile learning in forestry education. IOP Conference Series: Earth and Environmental Science, 507(1), 012031. https://doi.org/10.1088/1755-1315/507/1/012031

Weinbrenner, H., Breithut, J., Hebermehl, W., Kaufmann, A., Klinger, T., Palm, T. and Wirth, K. (2021). "The Forest Has Become Our New Living Room" – The Critical Importance of Urban Forests During the COVID-19 Pandemic. Frontiers in Forests and Global Change, 4(June), 1–19. https://doi.org/10.3389/ffgc.2021.672909

WHO. (2020). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

HOW TO BECOME A BETTER FORESTRY TEACHER AND PREPARE YOUR STUDENTS TO MEET THE GLOBAL CHALLENGES

ANNE NEVGI, NICLAS SANDSTRÖM AND MIKA REKOLA

Abstract

The current era is one of many crises and global challenges. This is particularly relevant for the field of silviculture as it can provide solutions to climate change and other challenges of sustainable development. A recent study on forestry education in Europe highlighted the lack of forest services and the fact that curricula address few cultural and social issues such as gender, ethnicity, and indigenous peoples in forestry education. It has been recognized that forest teachers need to prepare their students not only to be experts in technical forestry skills, but also to be able to communicate and work with people from diverse backgrounds. These challenges put pressure on the pedagogical skills of forestry teachers in terms of teaching issues that may be culturally challenging. In addition, forestry teachers are challenged to develop new ways of online and hybrid teaching. Many attempts have been made to improve teaching methods in forestry education, but there is also a need to improve forestry teachers' pedagogical competence and teaching skills. The problems related to social and cultural issues in general, and ethnicity, gender, and indigenous issues in particular, challenge teachers to reflect on their values, and on their moral courage to openly discuss these with their students. Forestry teachers need to become reflective teachers and a teaching portfolio is one of the best reflective tools for developing teaching skills and teacher competency. In addition, teaching portfolios have been used to assess teachers' teaching skills when recruiting candidates for teaching positions or promoting teachers in their academic careers. This paper discusses professional development, the continuous interplay between content and theory and teaching practices, and how teaching portfolios can be used as a reflective tool to improve forest educators' pedagogical competence to tackle difficult issues in forest education and to prepare their students to meet the challenges of the future.

Key words: forestry teacher, teacher competency, teacher development, pedagogical development, professional development, teaching portfolio,

Introduction

In forestry education, climate change and sustainable development are examples of topics that can easily become highly polarised, requiring teachers to address them delicately with their students (e.g. Maini, 1992; Hahn and Knoke, 2010; Baumgartner, 2019). Climate change is a topic that worries many young people and

in recent research about young people's beliefs and anxiety related to climate change and governments responses to it, most children, teenagers and young adults reported that they felt negatively about climate change, and they saw the future as frightening (Hickman *et al.*, 2021; Leiserowitz et al, 2011). In addition, climate change will have a major impact on forests, which also poses a challenge for forest science education.

In a global survey of forest education (Rekola *et al.*, 2021; Rekola and Sharik, 2022), teachers from primary education to higher education reported that they perceived climate change as having been covered sufficiently or excessively in curriculum and in their teaching. In tertiary level of forestry education, climate change and sustainable forest management are strengths of European forestry education in many, but not all, European countries. However, some forestry teachers reported that teaching about climate change and global warming is challenging for them (Rekola *et al.*, 2021, p. 25). Although the topic is relatively well covered in education at all levels of forestry education, it is also sensitive and politically polarised, and forestry teachers need support in how to address these topics with their students and how to prepare them as experts who can address these topics in their future careers in forestry. Besides teaching sensitive topics, forestry teachers may be unsure how to engage with students from different cultural and social backgrounds (Sharik *et al.*, 2015). A study on the state of forestry education in Europe found a lack of awareness of cultural and social issues such as gender, ethnicity, and minority issues in forestry education (Rekola *et al.*, 2021). The fact that curricula do not sufficiently address issues such as race/ethnicity or gender may suggest that forestry teachers need support in addressing these issues.

The aim of forestry education is not only to provide students with expertise and skills in forestry, but also to support them to develop communication skills and understanding of people from different cultural and social backgrounds (Gilless, 2015). Future experts in forestry should be able to interact and communicate with people who have diverse opinions on climate change and other politically polarised topics. A review on effective climate education suggested that in teaching this, teachers should use active and engaging teaching methods and focus on personally relevant and meaningful information (Monroe (a) *et al.*, 2019; Monroe (b) *et al.*, 2019). Forestry teachers may also lack the tools to support their students in acquiring communication skills, such as interaction skills with people from different cultural and social backgrounds or from marginalised groups (Rekola *et al.*, 2021; Rekola and Sharik, 2022).

In this paper, the aim is to outline how forest educators can develop their pedagogical competence as teachers and how to teach difficult and sensitive topics. First, we provide a theoretical framework for professional development both as a teacher and as an expert and discuss how teaching portfolios can be used as a reflective tool to improve the pedagogical competence of forest educators. Second,

we describe what to consider when teaching sensitive issues such as climate change or race/ethnicity. The pedagogical tools that forest science teachers can use to address sensitive issues in their teaching are also outlined.

Professional development: teaching and subject-matter expertise in forest-related knowledge

Forest expertise is based on strong theoretical and practical knowledge. Many forestry teachers in further and higher education have a background in research, whether in the field of forestry or in a related discipline. Through long and extensive research and practical experience, forestry teachers in higher education have acquired a broad and deep basic knowledge of different aspects of forestry, such as forest management, forest ecology and silviculture. This expertise provides forest teachers with a good basis for teaching and supporting students in learning. When we look at the expertise of teachers in vocational education and training, forestry teachers usually have good and extensive experience in practical forestry work. For example, they have worked for a long time in the forest industry, in forest management and have thus become experts in their field. Subject-specific forestry knowledge and expertise is an essential part of the pedagogical competence of forestry teachers, and it forms the basis on which pedagogical competence is built, because without subject knowledge expertise it is not possible to support students in their learning and answer their questions on the subject (See Figure 1).

Pedagogical expertise includes not only expertise in one's field, but also strong theoretical and practical knowledge and understanding of how to teach a subject in the most effective way to promote learning. Shulman (1986) coined the term pedagogical content knowledge (PCK) that consists of special types of knowledge such as subject matter content knowledge, pedagogical content knowledge, and curricular knowledge. PCK develops in a continuous reflective process when theory is implemented in practice (Shulman, 1986; Olsson and Roxå, 2013). As for any teacher, it is important for forestry teachers to have a strong foundation in the subject matter that they are teaching. This includes having a deep understanding of the scientific principles, concepts, and theories related both to forest sciences and pedagogical theories, as well as being able to apply this knowledge to real-world situations, and to support students' learning process.

Olsson and Roxå (2013, p. 51) define pedagogical competence as: "Such competence presumes that the teacher possesses broad, deep, high-quality knowledge of the subject of teaching and demonstrates an ability to use this knowledge in research-related, practical, pedagogical actions." A combination of subject matter expertise and pedagogical competence is essential for being an effective and successful forestry educator. Theory and practice are not separate, disconnected trajectories, but feed back into each other, developing content and

deepening our understanding of how best to teach students and facilitate their learning. The interplay of these dimensions is depicted in Figure 1.

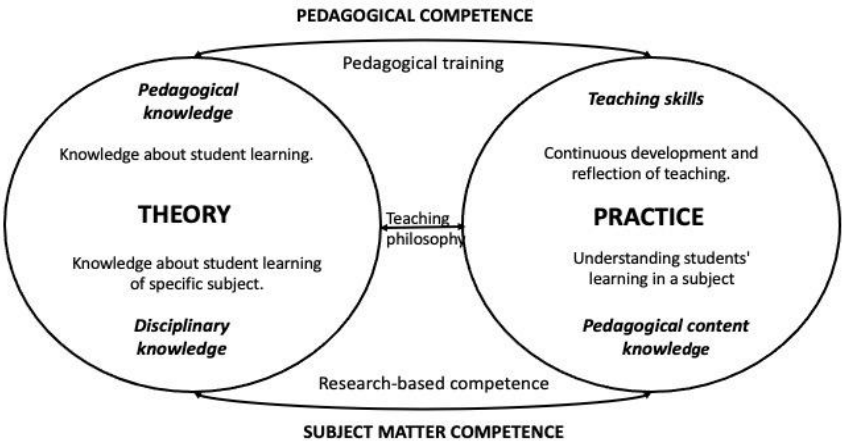


Figure 1. Interrelations of theory and practice in development of pedagogical competence and subject-matter competence.

Teaching portfolio – a tool to support pedagogical development

To make their pedagogical development and expertise as teachers visible to the teachers themselves, to the community and often also to recruiters, university teachers have for years been encouraged to create and maintain a portfolio of their work. The teaching portfolio is a means to both archive one's achievements and to envision both positive and negative experiences by themselves and as reported by students, all this facilitating reflection and improvement of one's approaches and tools. Seldin (2004, p. 3) defined the teaching portfolio as: "a collection of materials that document teaching performance." It brings together in one place all information and artefacts that provide evidence of an academic's expertise in teaching and professional development as a teacher. The portfolio provides evidence of educators' achievements in teaching in a similar way as publications, grants, and honours in research and scholarship. A teaching portfolio is used for three diverse purposes: (1) as a tool for recruiting the best teachers, (2) as a tool for rewarding the best teachers, and (3) as a tool for professional development (McLean and Bullard, 2000; Olsson and Roxå, 2013).

An individual forestry teacher can start documenting their teaching activities (e.g. lectures, tutoring, laboratory supervision, field teaching activities) by collating video and audio recordings, plans for teaching, syllabuses, and their own notes after teaching sessions documenting both what happened, and their own feelings during and after teaching. They can systematically collect and analyse student feedback at the end of teaching terms and can include feedback from colleagues and friends who

observed their teaching. The key to using a teaching portfolio as a tool for development is that teacher does not only collect all their activities and feedback, but also analyse and reflect on them. To learn to reflect on one's teaching experiences is the first step in developing as a teacher and starting to develop your own teaching philosophy (McLean and Bullard, 2000; Olsson and Roxå, 2013; Nevgi and Löfström, 2015).

Rapidly evolving digital technologies offer forestry teachers entirely new opportunities to explore and develop their own pedagogical knowledge and teaching skills. By videoing and recording their lectures, academics have the opportunity to reflect on how they communicate with students or what problems may have developed in interactive situations. A teaching portfolio can also be created in digital format, so it can contain not only notes and writings, but also teacher-created teaching videos, audio notes, podcasts, links to pedagogical literature and pedagogical support websites. Figure 2 shows how pedagogical development is linked to the construction and accumulation of theoretical pedagogical knowledge as forestry teachers gain teaching experience and begin to reflect on their teaching through the teaching portfolio. Digital tools are part of this reflection, as they allow them to explore their own teaching practices in a variety of ways. The pedagogical development process is described in Figure 2.

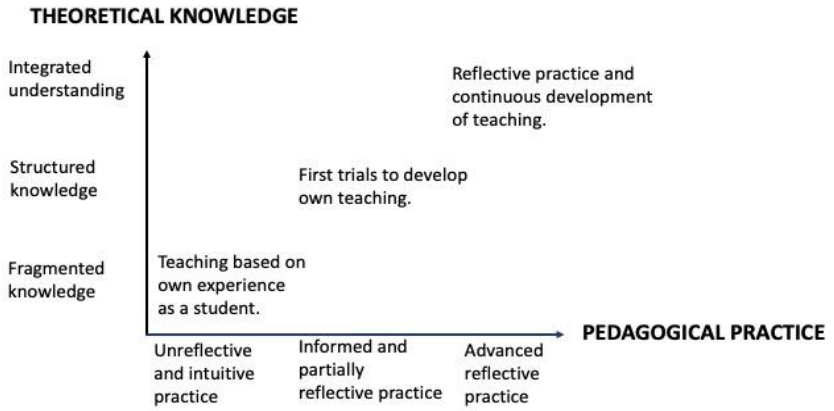


Figure 2. Pedagogical development process over time (modified from Olsson and Roxå, 2013, p. 51).

Challenges faced by forestry teachers and solutions to these challenges

In forest science teaching, substance expertise and pedagogical competency provide a strong basis for dealing with difficult or challenging topics. To address difficult issues and global challenges with students, academics must also have moral courage and emotional sensitivity. Teaching difficult issues and global challenges can be

emotionally and intellectually challenging, and it is important for teachers in all levels of forest education to approach these topics with care and sensitivity (Goodwin *et al.*, 2020; Staub, 2003). Although emotions were not included in Shulman's initial theory of PCK, subsequent studies have emphasized their critical significance in teacher-student interactions (Hargreaves, 1998; Garritz, 2010). Teaching issues that may be culturally taboo can be a sensitive and delicate matter. Strategies that forestry teachers can use to tackle difficult issues and global challenges with students include:

- Preparation: Assessing and identifying what may be sensitive about the subject being taught and identifying any factors that may have a strong impact on students' emotions.
- Creation of a safe and inclusive learning environment: Establishing ground rules for respectful discourse and creating a welcoming and inclusive environment can help students feel comfortable and supported as they study sensitive and complex issues (e.g. Cotán *et al.*, 2021).
- Encouragement of open and honest dialogue: Teachers are acting as guides and counsellors in the knowledge-building process of the students and encourage students to share their thoughts and feelings about the sensitive issue they are studying (Cotán *et al.*, 2021).
- Use of a variety of teaching methods: Incorporating a range of active learning methods, such as project-based learning, tripartite debate, role-play, and group work (e.g fishbowl, and learning cafés), can help students engage with the material and better understand different perspectives (Miklossy *et al.*, 2015).
- Support of critical thinking: Encouraging students to consider multiple viewpoints and perspectives about challenging issues (Rodríguez-Piñeros *et al.*, 2020).

Conclusions

In the current era of crises and global challenges in forest education, it is crucial to support forestry teachers to develop their pedagogical skills and teaching competence. As teachers play a critical role in shaping the minds and futures of the next generation of foresters, it is essential that they have the skills and knowledge needed to effectively educate and support students. There are many ways that teachers in the field of forest education can develop their pedagogical skills and competence, including:

- Integrating their own research into teaching, for example by involving students in research projects or giving them projects to help them combine theory and practice (Brew, 2003; Brew and Mantai, 2017; Mathieson, 2019).
- Participating in professional development opportunities (Clavert *et al.*, 2014; Clavert *et al.*, 2018; Postareff and Nevgi, 2015): Many schools and educational organisations offer professional development workshops, conferences, and other opportunities for teachers to learn new strategies and techniques for teaching and learning.

- Seeking out mentorship and guidance from more experienced educators (Clavert, Löfström *et al.*, 2018): Working with a mentor or coach can help teachers gain valuable insight and support as they develop their skills and knowledge.
- Engaging in reflective practice (Nevgi and Löfström, 2015: Olsson and Roxå, 2013): Regularly reflecting on one's teaching practices and seeking feedback from colleagues and students can help teachers identify areas for improvement and develop strategies for success.
- Keeping up with research and best practices: Staying up to date with subject-specific and pedagogical research and best practices in education can help teachers understand what works best in the classroom and how to effectively support their students' learning.

What SILVA Network can do to support forestry teachers' development as teachers and in teaching skills? By integrating pedagogical training into the Silva Network's initiatives and meetings, forestry teachers can elevate the quality of education they provide, ensuring that the next generation of forestry professionals is well-prepared, knowledgeable, and equipped with the skills needed to address the challenges of sustainable forest management in the 21st century. Overall, it is important for forestry teachers to be proactive in seeking out opportunities to learn and grow as educators, and to be open to new ideas and approaches to teaching and learning.

References

Baumgartner, R. J., 2019: Sustainable development goals and the forest sector—A complex relationship. Forests, 10(2), 152. https://doi.org/10.3390/f10020152

Brew, A., 2003: Teaching and research: New relationships and their implications for inquiry-based teaching and learning in higher education. Higher Education Research and Development, 22(1), 3–18. DOI: 10.1080/0729436032000056571

Brew, A and Mantai, L., 2017: Academics' perceptions of the challenges and barriers to implementing research-based experiences for undergraduates. Teaching in Higher Education, 22(5), 551–568. DOI: 10.1080/13562517.2016.1273216

Clavert, M., Björklund, T. and Nevgi, A., 2014: Developing as a teacher in the fields of science and technology. Teaching in Higher Education, 19(6), 685–696. https://doi.org/10.1080/13562517.2014.901957

Clavert, M., Löfström, E., Niemi, H. and Nevgi, A., 2018: Change agency as a way of promoting pedagogical development in academic communities: a longitudinal study. Teaching in Higher Education, 23(8), 945–962. https://doi.org/10.1080/13562517.2018.1451321

Cotán, A., Aguirre, A., Morgado, B. and Melero, N., 2021: Methodological strategies of faculty members: moving toward inclusive pedagogy in higher education. Sustainability, 13(6), 3031. https://doi.org/10.3390/su13063031

Garritz, A., 2010: Personal Reflection: Pedagogical Content Knowledge and the Affective Domain of Scholarship of Teaching and Learning. International Journal

for the scholarship of Teaching and Learning, 4(2), n2. DOI https://doi.org/10.20429/ijsotl.2010.040226

Gilless, J. K. 2015: The Berkeley Summit—Looking to the Future for Forestry Education. Journal of Forestry, 113(6), 587–591. https://doi.org/10.5849/jof.15-066

Goodwin, R., Graham, J. and Diekmann, K.A., 2020: Good intentions aren't good enough: Moral courage in opposing sexual harassment. Journal of Experimental Social Psychology, 86, 103894. https://doi.org/10.1016/j.jesp.2019.103894

Hahn, W.A. and Knoke, T., 2010: Sustainable development and sustainable forestry: analogies, differences, and the role of flexibility. European Journal of Forest Research, 129(5), 787–801. https://doi.org/10.1007/s10342-010-0385-0

Hargreaves, A., 1998: The emotional practice of teaching. Teaching and Teacher Education, 14(8), 835–854. https://doi.org/10.1016/s0742-051x(98)00025-0

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C. and van Susteren, L., 2021: Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey. The Lancet. Planetary Health, 5(12), e863–e873. https://doi.org/10.1016/S2542-5196(21)00278-3

Leiserowitz, A., Smith, N. and Marlon, J.R., 2011: American Teens' Knowledge of Climate Change. New Haven, CT: Yale Project on Climate Change Communication. http://environment.yale.edu/uploads/american-teens-knowledge-of-climate-change.pdf (accessed Oct. 18, 2023)

McLean, M. and Bullard, J.E., 2000: Becoming a university teacher: evidence from teaching portfolios (how academics learn to teach), Teacher Development, 4(1), 79–101, DOI: 10.1080/13664530000200104

Maini, J.S., 1992: Sustainable development of forests. Unasylva, 43(169), 3–8. https://www.fao.org/3/u6010e/u6010e03.htm (accessed Oct. 20, 2023)

Mathieson, S., 2019: Integrating research, teaching and practice in the context of new institutional policies: a social practice approach. Higher Education, 78(5), 799–815. https://doi.org/10.1007/s10734-019-00371-x

Miklóssy, K., Peltonen, H.O., Oroza, M.C., Matti, P., Korshuk, E., Palonen, E., Koponen, J., Nikuradze, M. and Nevgi, A., 2015: Intercultural Learning: Experiences of Multilateral Co-operation between Finnish, Georgian and Belorussian Universities. http://hdl.handle.net/10138/160231 (accessed Oct. 20, 2023)

Monroe, M.C., Oxarart, A. and Walkingstick, T., 2019a: Talking about climate change: How to enhance trust with forestry audiences. Applied Environmental Education and Communication, 18(1), 43–52. https://doi.org/10.1080/1533015X.2018.1431164

Monroe, M.C. Plate, R.R., Oxarart, A., Bowers, A and Chaves, W.A., 2019b: Identifying effective climate change education strategies: a systematic review of the research. Environmental Education Research, 25(6), 791–812. https://doi.org/10.1080/13504622.2017.1360842

Nevgi, A. and Löfström, E., 2015: The development of academics' teacher identity: Enhancing reflection and task perception through a university teacher development programme. Studies in Educational Evaluation, 46, 53–60. https://doi.org/10.1016/j.stueduc.2015.01.003

Olsson, T., and Roxå, T., 2013: Assessing and rewarding excellent academic teachers for the benefit of an organization, European Journal of Higher Education, 3(1), 40–61. https://dx.doi.org/10.1080/21568235.2013.778041

Postareff, L. and& Nevgi, A., 2015: Development Paths of University Teachers during a Pedagogical Development Course. Educar, 51(1), 37–52. https://doi.org/10.5565/rev/educar.647

Rekola, M., Nevgi, A. and Sandström, N., 2021: Regional Assessment of Forest Education in Europe: Creation of a Global Forest Education Platform and Launch of a Joint Initiative under the Aegis of the Collaborative Partnership on Forests. FAO.https://www.fao.org/3/cb6736en/cb6736en.pdf (accessed Oct. 18, 2023)

Rekola, M. and Sharik, T., 2022: Global Assessment of Forest Education: Creation of a Global Forest Education Platform and Launch of a Joint Initiative under the Aegis of the Collaborative Partnership on Forests (FAO-ITTO-IUFRO project GCP /GLO/044/GER). (Forestry Working Paper; No. 32). FAO. https://doi.org/10.4060/cc2196en

Rodríguez-Piñeros, S., Walji, K., Rekola, M., Owuor, J.A., Lehto, A., Tutu, S.A. and Giessen, L., 2020: Innovations in forest education: Insights from the best practices global competition. Forest Policy and Economics, 118, 102260. DOI: https://doi.org/10.1016/j.forpol.2020.102260

Seldin, P., 2004: The Teaching portfolio – A practical guide to Improved Performance and Promotion/Tenure Decisions. Bolton, MA: Anker Publishing Company.

Sharik, T.L., Lilieholm, R.J., Lindquist, W. and Richardson, W.W., 2015: Undergraduate Enrolment in Natural Resource Programs in the United States: Trends, Drivers, and Implications for the Future of Natural Resource Professions. Journal of Forestry, 113(6), 538–551. https://doi.org/10.5849/jof.14-146

Shulman, L.S., 1986: Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4–14. DOI: 10.2307/1175860

Staub, E., 2003: The psychology of good and evil: Why children, adults, and groups help and harm others. Cambridge University Press. https://doi.org/10.1017/CBO9780511615795

FOREST EUROPE INTRODUCES ITSELF – WHAT IS BEHIND THE POLITICAL PROCESS?

VERA STEINBERG

Abstract
Forest Europe presented itself during the 2022 SILVA Network annual meeting in Dublin. This Ministerial Conference on the Protection of Forests in Europe has under the German chairmanship three main streams; one of which is Green Jobs and Forest Education. Progress here was discussed.

Keywords: forestry education, green jobs, MCPFE.

Introduction

At the 2022 annual meeting of the SILVA Network, FOREST EUROPE was invited as a guest speaker to present the process and its work, discuss networking opportunities and invite the SILVA Network to become an observer of FOREST EUROPE.

What is FOREST EUROPE?
FOREST EUROPE (also Ministerial Conference on the Protection of Forests in Europe) is a pan-European voluntary high-level forest policy process. Since 1990, the aim has been to develop common strategies for the 46 signatories (45 European countries and the EC) on how to protect and sustainably manage forests.

The FOREST EUROPE Sustainable Forest Management (SFM) definition and set of criteria and indicators (C+I) are internationally regarded as guidelines for SFM.

Every four to five years, Ministers responsible for forests meet to endorse new declarations, decisions and resolutions. These commitments serve as a framework for implementing SFM, adapted to the national circumstances, but with a regional approach to strengthen international cooperation. The last Ministerial Conference was hold virtually due to the pandemic and chaired by the Slovak Republic. All reports and information about previous Ministerial Conferences can be found here: https://foresteurope.org/about/#prev-mc The International Secretariat, also Liaison Unit, is since 2021 situated in Bonn, Germany.

Under the German chairmanship (2021-2024), three areas of focus were agreed on:
- The further work on C+I and SFM (Work stream 1);
- a pan-European forest risk knowledge mechanism (Work stream 2);
- Green Jobs and Forest Education (Work stream 3).

Furthermore, a Rapid Response Mechanism was introduced to react to emerging issues, and the focus on communication was enhanced.

Green Jobs and Forest Education

Due to the focus area of Green Jobs and Forest Education, the contact between the SILVA Network and FOREST EUROPE was established in the beginning of 2021. The representative of FOREST EUROPE at the SILVA meeting, Ms. Vera Steinberg, presented the achievements and ongoing work in this work stream.

Green Jobs
An expert group was established, working on four different areas: 1. A proposal for a definition of Green Forest Jobs; 2. The transition of the working sector due to digitalization, new forms of education, gender aspects etc.; 3. Communication; 4. The analysis of changes in the sector due to new forms of jobs. Information of the work can be found here: https://foresteurope.org/workstreams/green-jobs/

The proposal for the definition of Green Forest Jobs will be discussed at the next Expert Level Meeting on 31st August 2022. [Note: the definition was agreed on and reads as following: "Green Forest Jobs provide forest-related goods and services while meeting the requirements of sustainable forest management and decent work."]

A report was written by the Thuenen Institute on Green Jobs in the pan-European forest sector, focussing on changes and new developments. The report will be published in summer 2022 and can be downloaded here: https://foresteurope.org/wp-content/uploads/2022/10/Thuenen-Green-Forest-Jobs-Report.pdf

A communication campaign "Grow Green Jobs" on Instagram was performed during February-May 2022. The idea behind the campaign was to promote best practise examples from the "Guidelines on the Promotion of Green Jobs in Forestry" by FOREST EUROPE, Food and Agriculture Organization of the United Nations (FAO) and the United Nations Economic Commission for Europe (UNECE). New jobs were displayed and the public was invited to tag and share their own Green Jobs under the Hashtag #growgreenjobs. The target group of this campaign were young mid 20s students and new graduates in forestry or related fields. All levels of students were invited to join, from technical schools to universities.

Forestry Education
A strong collaboration with the International Forestry Students' Association IFSA was established and two webinars were jointly held. Online lectures for universities were organized, to explain the process of FOREST EUROPE and promote its work. In this context, also an Open House was performed to increase the outreach: all

interested students and teachers were invited to join the event. A second Open House will take place in September 2022.

An event called “Youth Forest Policy Days” was jointly organized with IFSA and will take place at the beginning of December 2022. Here, students are invited to firstly participate at a Workshop and learn about Soft Skills or digitalization in the forest sector, and secondly attend the conference where panellists will discuss about SFM, afforestation and deforestation globally. [Note: the final report of the event is available: https://foresteurope.org/wp-content/uploads/2023/02/YFPD-Final-Report.pdf]

The participation at several events, such as the World Forestry Congress 2022 in Korea with the side event “Forest skills to pay the bills” or the SILVA conference 2021 was also part of the work.

Networking opportunities with the SILVA Network
The communication between FOREST EUROPE and the SILVA Network is well established and both initiatives share events on the respective websites and other channels. FOREST EUROPE invites the SILVA Network to become an observer of the process. This was discussed at the 2022 annual conference and SILVA Network members were in favour of this suggestion. To proceed in the formal manner, the SILVA Network will send a request to FOREST EUROPE in order to become an observer. FOREST EUROPE will then formally discuss and most likely agree on the request at the next Expert Level Meeting on 31st August 2022 [note from September 2022: the request was approved and the SILVA Network is formally an observer organization of FOREST EUROPE]. FOREST EUROPE is open to further networking activities and joint actions with the SILVA Network.

All information about FOREST EUROPE and the recordings of events can be found on www.foresteurope.org or the social media channels www.linktr.ee/foresteurope

PARTICIPANTS

Aleksandrowicz-Trzcińska, Marta
marta_aleksandrowicz_trzcinska@sggw.edu.pl
Warsaw University of Life Sciences, Institute of Forest Sciences,
Nowoursynowska 159, 02-776 Warsaw, Poland

Bálint, Heil heil.balint@uni-sopron.hu
University of Sopron, Faculty of Forestry,
Bajcsy-Zs. u. 4, H-9400 Sopron,. Hungary

Bowditch, Euan Euan.bowditch.ic@uhi.ac.uk
University of the Highlands and Islands, Scottish School of Forestry
Registered office: UHI House, Old Perth Road, Inverness,
IV2 3JH United Kingdom

Deeg, Veronique veronique.deeg@tu-dresden.de
Chair of Forest Policy and Forest Resource Economics,
Technische Universität Dresden, Piennerstrasse 8, 01737 Tharandt, Germany

Dohrenbusch, Achim adohren@gwdg.de
Faculty of Forst Sciences and Forest Ecology, University Göttingen
Büsgenweg 5, 37077 Göttingen, Germany

Doyle, Marie marie.doyle@ucd.ie
University College Dublin, UCD
Agriculture and Food Science Centre, Belfield, Dublin, Ireland

Janeczko, Emilia emilia_janeczko@sggw.edu.pl
Warsaw University of Life Sciences, Institute of Forest Sciences,
Nowoursynowska 159, Warsaw 02-776, Poland

Lewark, Siegfried siegfried.lewark@fobawi.uni-freiburg.de
Chair of Forest Work Science, University of Freiburg
Werthmannstr. 6, D-79085 Freiburg, Germany

Liebal, Sandra sandra.liebal@forst.tu-dresden.de
Chair of Forest Policy and Forest Resource Economics,
Technische Universität Dresden, Piennerstrasse 8, 01737 Tharandt, Germany

Kaimre, Paavo paavo.kaimre@emu.ee
Inst. Forestry and Rural Engineering
Estonian University of Life Sciences
Kreutzwaldi 56, Tartu , 51014 Estonia

Marozas, Vitas vitas.marozas@vdu.lt
Vytautas Magnus University, K. Donelaičio g. 58,
44248, Kaunas, Lithuania

Mohanan, Frank frank.monahan@ucd.ie
University College Dublin, UCD
Agriculture and Food Science Centre, Belfield, Dublin, Ireland

Müller–Starck, Gerhard gerhard@mueller-starck.de
Technische Universität München
Study Program Division Forest Science and Resource Management
Hans Carl von Carlowitz-Platz 2, D-85354 Freising, Germany

Nevgi, Anne-Marja anne.nevgi@helsinki.fi
Caledonia Hub, Faculty of Educational Sciences
PO Box 9, FI-00010 University of Helsinki, Finland

OConnor, Deirde deirdre.oconnor@ucd.ie
University College Dublin, UCD
Agriculture and Food Science Centre, Belfield, Dublin, Ireland

Onatunji, Alex alexonatunji@gmail.com
Chair of Forest and Environmental Policy, University of Freiburg,
Tennenbacher Straße 4, 79106 Freiburg, Germany.

Rekola, Mika mika.rekola@helsinki.fi
Department of Forest Sciences, P. O. Box 27 (Latokartanonkaari 7),
00014 University of Helsinki, Finland

Schmidt, Pieter pieterschmidt102a@gmail.com
Generaaal Foulkesweg 347, 6703 DN Wageningen, The Netherlands

Steinberg, Vera vera@steinberg@foresteurope.org
European Forest Institute, Platz der Vereinten Nationen 7,
53113, Bonn, Germany

Tobin, Brian brian.tobin@ucd.ie
University College Dublin, UCD
Agriculture and Food Science Centre, Belfield, Dublin, Ireland

Tullus, Hardi hardi.tullus@emu.ee
Inst. Forestry and Rural Engineering
Estonian University of Life Sciences
Kreutzwaldi 56, Tartu , 51014 Estonia

Urban, Josef josef.urban@email.cz
Faculty of Forestry and Wood Technology
Mendel University in Brno, Zemedelska 361300 Brno Czechia

Veemees, Anneli anneli.veemees@emu.ee,
Inst. Forestry and Rural Engineering
Estonian University of Life Sciences
Kreutzwaldi 56, Tartu , 51014 Estonia

Wasser, Iring gf@asiin.de
ASIIN e.V., PO Box 10 11 39, 40002 Düsseldorf Germany

Weber, Norbert nweber@tu-dresden.de
Piennerstrasse 8, 01737 Tharandt, Germany

Wilson, Edward edward.wilson@ucdconnect.ie
University College Dublin, UCD
Agriculture and Food Science Centre, Belfield, Dublin, Ireland

Ziesak, Martin martin.ziesak@bfh.ch
Hochschule für Agrar-, Forst- und
Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

NON-PARTICIPATING AUTHORS

Bronisz, Karol karol_bronisz@sggw.edu.pl
Warsaw University of Life Sciences, Institute of Forest Sciences, Nowoursynowska 159, Warsaw 02-776, Poland

Sandström, Niclas Niclas.Sandstroem@helsinki.fi
Caledonia Hub, Faculty of Educational Sciences
PO Box 9, FI-00010 University of Helsinki, Finland

PROCEEDINGS OF THE SILVA NETWORK CONFERENCES

See also www.silva-network.eu

Year	Location	Title	Editors	Published in, as
1997	Wageningen, Netherlands	New requirements for university education in forestry	Schmidt, P. Huss, J., Lewark, S. Pettenella, D. & Saastamoinen, O.	1998, DEMETER SERIES 1
1998	Joensuu, Finland	Forestry in changing societies in Europe. Information for teaching module. Part I and Part II.	Pelkonen, P. Pitkänen, A. Schmidt, P. Oesten, G. Piussi, P. & Rojas, E.	1999, SILVA Network
2002	Warsaw, Poland	ITC in higher forestry education in Europe	Tahvanainen, L. & Pelkonen, P.	2004, SILVA Network Publications 1
2003	Beauvais, France			
2004	Freising, Germany	Quality and competence in higher forestry education	Tahvanainen L. Pelkonen, P. & Mola, B.	2004, SILVA Network Publications 2
2005	Wageningen, Netherlands	Forestry education between science and practice.	Schmidt, P. & Bartelink, H.H.	2006, SILVA Network Publications 3
2006	Valencia, Spain	Quality assurance and curriculum development in forestry and related sciences.	Schmidt, P. Rojas-Briales, E. Pelkonen, P. & Villa, A.	2007, SILVA Network Publications 4
2007	Freiburg im Breisgau, Germany	Design and functioning of international forestry curricula: considerations and experiences	Schmidt, P. & Lewark, S.	2008, SILVA Network Publications 5
2008	Copenhagen, Denmark	What do we know about our graduates? Graduate analysis for forest sciences and related curricula	Schmidt, P. Lewark, S. & Strange, N.	2010, SILVA Network Publications 6

2009	Thessaloniki, Greece	Development of forest sciences curricula in Europe	Schmidt, P. Lewark, S. & Aravanopoulos, F.A.	2013 SILVA Network Publications 7
2010	Zagreb, Croatia	Bachelor / master education in forest sciences – Ready for the next decade?	Schmidt, P., Susnjar, M. Müller-Starck, G. & Lewark, S	2013, SILVA Network Publications 8
2011	Saint Petersburg, Russia	Bologna cycles 1 to 3 in higher forestry education – Objectives and reality	Schmidt, P., Müller-Starck, G., Chubinsky, A. & Lewark, S.	2014, SILVA Network Publications 9
2012	Lleida, Spain	Do students learn what they will need later? About expected learning outcomes and competences of graduates	Schmidt, P. Vega-Garcia, C. Müller-Starck, G. & Lewark, S.	2014, SILVA Network Publications 10
2013	Istanbul, Turkey	From teaching to learning – When will we take it seriously in forest sciences education?	Schmidt, P. & Lewark, S.	2015, SILVA Network Publications 11
2014	Zollikofen, Switzerland	Practice orientation in forestry curricula in universities and universities of applied sciences	Schmidt, P. Lewark, S. Müller-Starck, G. & Ziesak, M.	2016, SILVA Network Publications 12
2015	Vienna, Austria	Should all forestry students learn the same? Generalist or specialist approaches	Schmidt, P. Hasenauer, H. & Lewark, S.	2016, SILVA Network Publications 13
2016	Tartu, Estonia	Forest science education: Self-study and activation of the learner	Schmidt, P. Lewark, S. & Reisner, V.	2017, SILVA Network Publications 14

2017	Prague, Czech Republic	Forest for university education: Examples and experiences	Schmidt, P. Lewark, S, Remeš, J. & Weber, N.	2018, SILVA Network Publications 15
2018	Padua, Italy	Quality management and accreditation for study programmes in forest sciences and related disciplines	Schmidt, P. Lewark, S. Pirotti, F. & Weber, N.	2020, SILVA Network Publications 16
2019	Tharandt, Germany	Twenty years after the Bologna declaration. Challenges for higher forestry education	Schmidt, P. Lewark, S. & Weber, N.	2021, SILVA Network Publications 17
2021	Tharandt, Germany	Digitalization in higher forestry education – Teaching and learning revisited	Schmidt, P. Lewark, S. & Weber, N.	2023, SILVA Network Publications 18
2022	Dublin, Eire	Higher forestry education in times of multiple crises: crises as framework conditions, challenges and triggers for improvements	Schmidt, P., Lewark, S., Doyle, M. & Weber, N.	2025, SILVA Network Publications 19

HIGHER FORESTRY EDUCATION IN TIMES OF MULTIPLE CRISES:

Crises as framework conditions, challenges and triggers for improvements