

Proceedings

IUFRO Symposium on Forest Education

– Merging theory and practice with help of digital tools

October 2-4, 2023, Finland

Symposium discussed gaps in forest education at university and college level including further education, curriculum of forest education such as Forest Education Global Core Curriculum (FEGCO), and digital tools and platforms. The aim of the symposium was to discuss about how education could find best ways to combine theory and practice and how digital tools could be used to enhance forest education.

Organiser: IUFRO Research Group 6.09 Forest Education. Mika Rekola (chair), University of Helsinki (UH)

Place: Finland, University of Helsinki (Helsinki in Viikki campus and field station Hyytiälä), Lohja, Nemus Futurum visit by Metsä Group and partly virtual platform (hybrid).

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Combining marteloscopes with mobile digital tools for training forest practitioners in the forest

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Marteloscopes have emerged as valuable tools for decision support in forest management and to provide onsite training and education of forest owners, forestry professionals and students. Marteloscopes are rectangular forest sites typically of one hectare, where all trees are numbered, mapped, and recorded. Linked to the marteloscopes, forest practitioners can use digital tools such as the mobile application I+ trainer to perform virtual tree selection exercises and compare alternative forest management strategies in the field and giving them immediate feedback of their decisions in terms of environmental (biodiversity) and economic impacts. The results are directly visible on-site and can immediately be re-evaluated and jointly discussed amongst exercise participants. This enhances learning success through direct feedback and improve decision making capacities.

The concept of marteloscopes was originally developed in France and over 200 marteloscopes have so far been established within Europe. In Finland, the first three marteloscopes have been established and measured between 2021 and 2023 in forests owned by the city of Joensuu in North Karelia. The first marteloscope site at Pärnävaara consists mainly of Scots pine on dryish heathland and the development class being grown up growing forest. The second marteloscope in Repokallio area has the fertility class of grovy heathland and is more fertile than the first one. The main tree species is Norway spruce and the development class is mature forest. The third marteloscope is also located in the Repokallio area on green heathland site with a mixture of tree species. All the three marteloscopes are easily accessible by car and rather short walks along good paths. The data from these marteloscopes have been made available for use with the I+ trainer application, which is freely available.

Trainings have been organised between 2021 and 2023 in the three marteloscopes sites in which altogether 70 forest owners participated. In the Scots pine stand the emphasis of the training was thinning, e.g. which trees to select in order to manage the forest with economically acceptable results and to preserve the biodiversity values. The mature Norway spruce stand, with a high number of microhabitats, provided an excellent learning environment for assessing the impacts of selective cutting to biodiversity, economic income and carbon balance of the forest. Exercises, such as selecting the trees for the group of retention trees or for selective cutting, seemed to be useful to the forest owners.

According to feedback collected after the training events, the marteloscope concept was new to the Finnish forest owners, but the possibilities of virtual tree selection, with immediate feedback about the impacts of the selected management, were well recognised by the participants. In the trainings, the focus was on three themes: selective cuttings, preserving the biodiversity, and planning a group of retention trees. According to the participants, the exercises were logical, but some effort was needed to complete them. In order to obtain the best results, all the trees of a marteloscope need to be assessed whether the tree will be removed, remained or retained. However, the participants found the I+ trainer application quite modern and illustrative.

The utilisation of the marteloscopes will be extended to the education of forestry students and forest professionals. The exercises for various topics are being planned, such as assessment and measurement of single tree, tree selection for thinning, continuous cover forestry, biodiversity management and forest carbon storage.

Gender issues in forestry education in Brazil

Claudia Moster

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Achieving gender equality is one of the Sustainable Development Goals (SDGs) created by the UN in 2015 at the United Nations General Assembly forming the 2030 Agenda for Sustainable Development (ONU MULHERES BRASIL, 2015). Although about 54% of Ph.D. students are women, there is a discrepancy between areas of expertise, predominantly in biological sciences and represent less than 25% of participation in math sciences and engineering. In the Brazilian Academy of Sciences, women represent only 14%. In political representation, the distancing of the female presence is also apparent, as well as in leadership positions and social prominence (DE NEGRI, 2019). On the other hand, Brazil has the highest percentage of scientific articles signed by women in Latin America and the Ibero-American community. Between 2014 and 2017, it was published around 53,300 articles, of which 72% were signed by female researchers (ALBORNOZ et al. 2018).

In this study, developed during 2021 and 2022, it was collected data about the representation of women as professor in Forestry Engineering bachelor courses in Brazil. It was found data about 45 institutions. The results indicated 320 women in a total of 992 professors, that is, a representation of 32% in total. In the distribution according Brazilian administrative region, the distribution of female professor is 38% in the Northeast, 35% in the North, 32% in the Midwest, 26% in the Southeast and 34% in the South. From the total institutions, only four had a minimum representation of 50% of women in the Forest education, with the higher occurrence of 89% in the Instituto Macapaense do Melhor Ensino Superior, Macapá - PA.

Also in the forestry sector, gender equality was incorporated into the Forest Stewardship Council (FSC) international forest management certification system in 2015, when criterion 2.2 was established: "The Organization will promote gender equality in employment practices, job opportunities, training, hiring, engagement processes and management activities" (FSC, 2016). The university environment should be the model that the society expect about the human interactions, and the gender equality is a example of the difference with reality.

Forestry education: a multidimensional challenge for forestry Mexico in the xxi century?

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Mexico has valuable characteristics to achieve sustainable forestry development by having large forest ecosystems in temperate-cold, tropical and subtropical zones and in arid and semi-arid zones, as well as an important internal market, geographical location and free trade agreements, among others, that give access to the largest economies in the world. However, in Forestry Mexico, perhaps there is no more urgent challenge than that of Forestry Education to face the enormous challenges of the 21st century, since the dynamics of continuous changes over time impact the dimensions in the forestry field: sociocultural, economic-financial, environmental, political-institutional-legal and scientific-technological. This means that forestry education faces great challenges, due to the rapid and constant changes in society and its forest ecosystems. These changes can make the visions and strategic actions of the Forestry Education institutions that have been in force become obsolete and surpassed by a lack of timely multidimensional response capacity of said institutions to address the socioeconomic and ecological forestry system of our country with a holistic vision. This coupled with the fact that the challenge of the forestry field with a multidimensional vision currently turns out to be broader than when the sector was understood with the traditional approach. This challenge with the new conceptualization that we must have of Forestry Mexico requires that the role that foresters have to play necessarily requires changes in the source of forestry professions and forestry education institutions in correspondence and relevance of the exercise of public policies, and in particular of forestry policy, with a prospective approach. In this reconceptualization, the new approaches and intangible values of the forest ecosystem must be considered, expanding the forest concept and taking into account the social and community dimension in sustainable forest development. This forces forestry education programs and strategies to constantly adapt to these changes in order to train professionals capable of contributing to the sustainable forestry development of our country. This condition means that the forestry professional must understand the multi and transdisciplinarity of the forest socioeconomic and ecological system. For this reason, Forestry Education must respond to dynamics that are associated not only with trends in labor demands for forestry professionals, but also with forestry and environmental policies in the context of Mexico's Public Policies, as well as the requirements established by the 2030 Agenda of the United Nations (UN) through its strategic objectives (17). In relation to education, the 2030 Agenda specifically includes Strategic Objective 4, which establishes: "Ensure inclusive and equitable quality education, and promote lifelong learning opportunities for all".

Educational method to study wood and wood-based materials using digital technology

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In Japan, the timber self-sufficiency rate is on a recovery trend, and wooden school buildings have been constructed in various places to promote wooden construction in public buildings recently. Most of them used wood-based materials, such as a laminated lumber and plywood. Technological development of these is also progressing. In contrast, many wooden houses where students reside have pillars covered with walls. In addition, it is difficult to understand the properties of wood and wood-based materials as there are few opportunities to work with wood in daily life. From now on, students need to know the functionality of wood materials to ensure a comfortable indoor environment and energy efficient buildings.

Therefore, a teaching method to understand the difference between wood and wood-based materials using the wooden flooring used in the rooms where students reside daily as a subject was devised. Solid wood from several tree species and composite flooring were laid on the floor, the tactile warmth was confirmed, and the resistance to damage and dirt was evaluated. Subsequently, the cross section was observed using a digital microscope. The students understood that solid wood has cells arranged regularly, whereas composite flooring comprises thin boards glued together in layers.

In addition, students used virtual reality (VR) goggles to understand the expanse of space. Shooting data of three wooden flooring rooms with different colors and grains and a white tile room were captured using a 360-degree omnidirectional camera and saved in VR goggles for comparison. The students could move between different rooms instantly by pressing a switch on the VR goggles. Therefore, the use of digital tools can be beneficial for studying various types of wood and wood-based materials.

Furthermore, we have created VR forest observation teaching materials to understand the difference between planted forests and natural forests. This video was taken while walking along a trail with a natural forest on the right and a planted forest on the left. In a planted forest, trees of the same type are neatly arranged, with the lower branches of the tree have been cut leaves so that the leaves are thriving on the top of the tree. On the other hand, various types of trees grow in a natural forest. Students can change their viewpoint by using the mouse, allowing them to understand the differences in the forest.



Collaborative curriculum development with higher education students: a case study of crafting a bachelor's programme in forest bioeconomy

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Creating a comprehensive curriculum thrives on the involvement and insights of different stakeholders, students being noted as one of the most relevant. Student participation has the potential to contribute not only to the curriculum itself but also to the relationship between the students and other stakeholders, enriching and benefiting all the parties. This paper explores the diverse perspectives of master's students in the preliminary stages of curriculum development for an international undergraduate program focusing on forest bioeconomy.

The methodology used is focus groups to investigate in depth the retrospective experiences of students/alumni from four master programmes in four consecutive years from 2018 to 2022 at the School of Forest Sciences, University of Eastern Finland: Two with a focus on European Forestry one on Boreal Forestry and one on Wood Materials Science. To provide a wide variety of results, another consensus technique 6-3-5 Nominal Group Technique was also used. The novelty of this technique is that it is applied in virtual settings using a whiteboard software tool.

Preliminary findings showed that there was room for improvement in the curriculum development in the case studied. These included issues related to interaction between students and other stakeholders, as well as equality and diversity. Addressing these questions could lead to improved student engagement, success, and retention. The paper contributes to the discussions on student participation and engagement in higher education and supports other studies on forest education and inclusivity. The research can help identify gaps in content and methods within the curriculum development process. It also provides good practices for collaborative curriculum development for a wider audience.



Environmental education implemented by the State Forests in Poland- from walks in the forest to virtual reality.

Jaroslav Bator

National Forest Holding State Forest- Oborniki Forest District

The aim of forest education of the society is to raise awareness and spread knowledge about the natural environment, sustainable forest and water management, especially in the context of climate change and social expectations.

This presentation contains an overview of the forms and tools used in the education system in the State Forests in Poland on the example of Oborniki Forestry Inspectorate. In addition, it shows how practitioners can engage in the transfer of the theory to the society.

Ecological education in the Oborniki Forest Inspectorate has been conducted since 2004. It has undergone a kind of evolution, from a modest educational room equipped with a multimedia projector and various exhibits, to a modern multimedia educational center. An important component in the education process is the forest infrastructure used to conduct classes and meetings in the forest. This is how a direct form of education addressed to many interested stakeholders, i.e. "from kindergarten to the elderly" is implemented. We are dealing here with a situation in which foresters have direct contact with the audience. It is supplemented with off-site meetings including visits to educational institutions, libraries, presence at various festivals, fairs, competitions and similar events. Foresters are also present there and have the opportunity to interact directly with the participants of the events.

Forest infrastructure in the form of marked routes, paths, trails with educational boards is a bridge between direct and indirect education. It can be organized and clearly thematically oriented or used by individuals staying in the forest for other purposes, and using the educational offer by the way. Visiting the forest gives great opportunities from usual walks on designated trails through the so-called green checkpoints or geocaching routes to forest games prepared in cooperation with teachers. This form of tourism and spending time actively in the forest is a very interesting way of getting to know and experiencing the forest.

Indirect education includes those activities in which we do not have direct contact with the audience, but we still can arouse interest, inspire and let the audience understand the environmental issues. This is happening thanks to extensive campaigns carried out through various communication channels. With the help of television, radio, press, large-format billboards, you can reach a wide audience. Facebook profiles are also becoming more and more popular. It is a fast communication medium that can be used to prepare compressed doses of knowledge or to convey key messages.

During the presentation various tools used during the classes will be discussed. Foresters have at their disposal traditional teaching aids such as didactic boards, animal models, leaves, tools and modern ones such as films and applications. Today's world uses images and that is why the process of education is full of them. The hit is a virtual reality, which gives a practically unlimited range of possibilities when it comes to using image and sound to present selected content. In addition, it takes the user to a completely different level of emotional experience in comparison to traditional movies.

Also facilities for people with special needs (audio description, sign language, subtitles in Braille) are an important tool. All these tools are of great importance because in the forest we are able to see a specific part of space at a specific time. The above-mentioned tools are used to illustrate the complexity of processes and phenomena occurring in the natural environment. Thanks to the fact that the competent staff of the State Forests is involved in the process, the message becomes professional and credible.

HyFlex graduate program in Forest Business: the adult continuing education business model

Pipiet Larasatie

The College of Forestry, Agriculture, and Natural Resources, University of Arkansas

The College of Forestry, Agriculture, and Natural Resources in University of Arkansas at Monticello examines the employment needs of natural resource management industries and organizations in Arkansas on a regular basis. Throughout the course of the last few decades, forests and forest industry have made important contributions to the economic well-being of rural Arkansas. In addition, they have had a considerable cultural impact on the region. At the present time, Arkansas has the third most dependent economy on timber in the United States and the most dependent economy on timber in the Southern United States. In terms of the percentage of the state's total GDP that is contributed by timber, Arkansas ranks third overall. The state's forestry industry is responsible for more than 60,000 jobs and provides more than \$6 billion to the state's GDP on an annual basis.

A survey was distributed to the state's 406 foresters who are currently licensed to engage in forestry work in Arkansas. The purpose of the survey was to determine whether or not advanced forest business programs are required by the state's forestry profession. The poll received a response rate of 23%, with 94 total responses. 44% of respondents responded that a certificate program in forest business would be very to extremely useful. One hundred and ninety-nine percent of respondents expressed a desire for the course to be made available in an online or hybrid format, and the majority of respondents (85%) expressed a strong preference for evening session times during the week.

Responding to this survey, The Arkansas Center for Forest Business at the University of Arkansas at Monticello is constructing graduate certificate and master's degree programs in forest business that will use a Hybrid-Flexible or HyFlex format. This means that all of the classes that are taught will be made available in-person, online, and asynchronously. This will fit the needs of working professionals who, in order to further their education, must plan their classes around their employment and family responsibilities. Financially, the costs are kept low as the Center has permanent funding adequate to afford all resources.



Micro-Certificate programming.

Jorma Neuvonen

Faculty of Forestry, University of British Columbia

In this presentation, we explore the innovative implementation of micro-certificates for the ongoing education of forestry professionals within the University of British Columbia's Faculty of Forestry. I delve into our historical background, locations, academic programs, and our esteemed faculty, highlighting the diverse student and academic bodies involved. Specifically, I emphasize the challenges faced by both recent graduates and working forestry professionals, underscoring their need for practical skills and knowledge applicable directly to their work.

We take a historical perspective, discussing the past Forest Management Institute of BC and its advanced education programs in silviculture, a significant precursor to our current endeavors. The presentation details the importance of government policies, especially the Micro-credential framework, and the need for upskilling within the professional forestry domain. With the fast-paced changes in the work environment, including climate change strategies and technological advancements, the need for micro-credentials becomes evident.

I elucidate the definition of micro-certificates, focusing on their practicality, competency-based learning, industry recognition, and the convenience of digital badges in the online sphere. The Online Climate Vulnerability And Adaptation Micro-certificate (CVA) program is introduced as an example, addressing the increasing demand for climate-related competencies among professionals. The program's structure, flexibility, and development process, which involved collaboration with various industry and government professionals, are outlined.

The core aim of this presentation is to demonstrate how our micro-certificates, exemplified by the CVA program, bridge the gap between theoretical knowledge and practical application, meeting the evolving needs of forestry professionals, especially concerning climate change. The endeavor's approach involves an extensive analysis of gaps, relevancy, and the specific needs of forestry professionals at local, national, and international levels.

Comparing Contents between Forest Science Education in Undergraduate Universities and Qualifying Examinations for Professional Experts Related to Forest in Japan

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Tama Forest Science Garden, Forestry and Forest Products Research Institute, Forest Research and Management Organization

Forest science education is provided at 33 universities and colleges in Japan in 2022. About half of university graduates from forest science courses find jobs related to forest management as public servant, forestry associations and other private companies. For professional experts related to forest disciplines, there are several qualifications, i.e. forestry extension supervisor and professional engineer.

In this study, we tried to compare educational contents in undergraduate universities and professional knowledge and ability for forestry experts to qualifying examines in the fields of forest science. We used the results of a national survey related to forest education in universities and colleges conducted in 2021. This survey was conducted to faculty members in 27 schools, and twenty-five schools answered it; 8 schools had a forest science special course in a department, 10 schools had these courses, and another 7 schools taught them as part of another course such as agri-biological resource, environmental science and ecology and so on. We used the results of contents analyses about two qualifying examinations for forest experts, too. These surveys were analyzed qualifying examination's questions for professional engineers of forest disciplines since 2004 to 2020, and for forestry extension supervisors since 2012 to 2021.

As the result, each university or college offered various contents related to forest science. The educational contents of forest science were divided into 11 elements include forestry and wood science. The curricula in universities and colleges were divided into next three types by necessity of forest science contents: 1) various contents of forest science included in required subjects in 12 schools, 2) various contents of forest science could be chosen as elective subjects in 10 schools, and 3) other 4 schools offered only several contents of forest science. By the way, extensive knowledge was necessary for qualifying examinations in the fields of forests and forestry for professional experts. To compare these results, it was considered that there was a gap between professional forest science education in universities and required skills and knowledge for professional experts in the field of forest and forestry.

In conclusion, forest education should be reexamined to include essential contents in line with social demands such as professional human resource development.

Global Virtual Seminar in the MSc European Forestry programme – A joint effort of six European universities

Marjoriitta Möttönen

University of Eastern Finland

MSc in European Forestry is an accredited double-degree Erasmus+: Erasmus Mundus MSc programme jointly organised by six universities: University of Eastern Finland, AgroParisTech, University of Freiburg, University of Lleida, University of Natural Resources and Life Sciences Vienna, and Transilvania University of Braşov. All partner universities collaborate intensively in the programme delivery by offering joint study modules in addition to their existing curricula. In addition, Associated Partner universities in Brazil, Canada and China and Associated Industrial and Scientific Partners contribute to the programme delivery. The aim of the programme is to provide academic education in the field of sustainable resource management with special emphasis on bioeconomy. The curriculum of the programme is specifically designed to take into consideration the needs of potential employers and therefore our graduates are highly valued by national and international agencies, governmental bodies, NGO's, research institutions and timber, paper and pulp enterprises.

Global Virtual Seminar (3 ECTS) is one of the jointly organised courses included in the curriculum. It is introduced here as an example of good practise on how to involve several universities in organising a joint course, how to include current topics in the curriculum and how to teach project management, time management and communication skills to students coming from different cultural backgrounds in a digital, online environment.

This course runs throughout the first year. The overall aim is to evaluate the national achievements of the SDGs in a global context from the perspective of the home countries of the students. At the beginning of the course, students are distributed into groups in a way that all members of each group come from different countries or continents. This allows gaining a broader perspective of the different national activities in respect to selected SDGs targets. In addition, a group supervisor from one of the universities is nominated for each group. The topics of the students' projects vary between the years but are always focusing on selected targets of the 17 SDGs. Students in each group are asked to generate an outline, how they would like to investigate their special topic. Students familiarize themselves with their chosen topic by critically examining the recent scientific literature and the available material on the online learning environment including example videos related to SDGs. A detailed investigation is then done by interviewing experts from their home countries with open ended questions. Monthly online meetings are used to monitor student progress and provide an opportunity to raise any concerns and questions they may have related to their projects. At the end of the course each student prepares an individual online presentation based on the findings from the interviews and literature for the home country and presents it to all other students within the group and to the group supervisor. In the final seminar all groups summarize their country-specific findings and provide a comprehensive summary between the countries. The final seminar provides students an in-depth view on differences and similarities between countries on their chosen topics.

After this course, students have a global view about the SDGs with a special focus on the chosen topics. In addition, Keynote Talks by experts from the Associated Partners in the final seminar provide feedback for each student project and bring additional value by highlighting the importance of evaluating SDG's in a global context. The project work within multicultural groups and lasting for the whole academic year improves students' project management, teamwork, critical thinking, leadership, data management, communication and time management skills and teaches them responsibility to carry out long-term projects which are the skills that are very much appreciated in the working life.

Forest education policies in Argentina. Challenges of the new quality standards and the incorporation of ICTs

Sandra Sharry

National University of La Plata

In Argentina, the Article 43 of the Law on Higher Education establishes that the curricula for careers corresponding to professions regulated by the State, the exercise of which could compromise the public interest, directly endangering the health, safety and property of the inhabitants, must take into account the basic curricular contents and the criteria on the intensity of practical training established by the MINISTRY OF EDUCATION in agreement with the COUNCIL OF UNIVERSITIES. The Ministry must establish, with the agreement of the COUNCIL OF UNIVERSITIES, the professional activities reserved to those who have obtained a degree included in the list of Article 43 of the Law on Higher Education. Such careers must be periodically accredited by the NATIONAL COMMISSION FOR UNIVERSITY EVALUATION AND ACCREDITATION (CONEAU) or by private entities constituted for that purpose, in accordance with the standards established As of Resolution 1591/21 of the Executive Committee of the National Interuniversity Council (CIN), the new Minimum Curricular Contents, the Minimum Hourly Load, the Intensity Criteria of the Practical Training and the Standards for the Accreditation of the Forestry Engineering Degree, as well as the Professional Activities Reserved to the Degree have been approved recently. It is necessary to analyse the complexities faced by the professional through this Resolution, and an analysis of the current situation and the challenges that will be faced by the curriculum, the scope of the degree and other suggestions to be taken into account in the necessary changes to be made in the career. On the other hand, the emergence of COVID 19 forced a transition from face-to-face education, the most frequent modality in the faculties where forestry courses are taught, to distance education. This emergency transition was a major challenge for teachers and students and has both negative and positive aspects.



Innovative Sustainable Forest Management Education in the Asia-Pacific Region

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The concept of Sustainable Forest Management (SFM) has emerged globally as an essential element for the sustainability and conservation of the world's forests. Regional gaps exist in how to continually and equitably update forestry professionals and practitioners around the world with new knowledge of SFM and new technologies to manage natural resources and implement effective policies. Providing global access to open and credential high-quality education resources and opportunities becomes extremely important to narrow the regional gaps and improve SFM practices.

To address the challenges, a joint educational online program entitled Innovative Sustainable Forest Management Education in the Asia-Pacific Region was initiated in 2014. Content experts from regional forestry universities in the Asia Pacific Forestry Education Coordination Mechanism (AP-FECM) network were invited to develop coursework and formed an international collaborative development team with broad knowledge of SFM. A total of 14 online graduate certificate courses were developed with their fundamental content as Open Educational Resources (OER).

As the only SFM online program of its kind, since 2016, the joint educational program provides world-class forestry education resources created and supported by leading professors and experts from internationally recognized universities around the world. Its OER courses reached out to over 15,000 learners from over 90 international economies and its instructor-led repurposed OER Courses by AP-FECM had over 3800 learners from over 135 universities, based on our records before and during Covid-19 Pandemic until 2020.

As a key unit to operate and manage the project, the Executive Office (EO) of the AP-FECM is responsible for continuously encouraging global utilization of the curriculum and increasing international recognition of the project. Phase III of the project will be on agenda in 2023 to have another handful of courses developed. More relevant content experts are sincerely invited here to join the great effort toward promoting Sustainable Forest Management and increasing equity in forest education around the world.