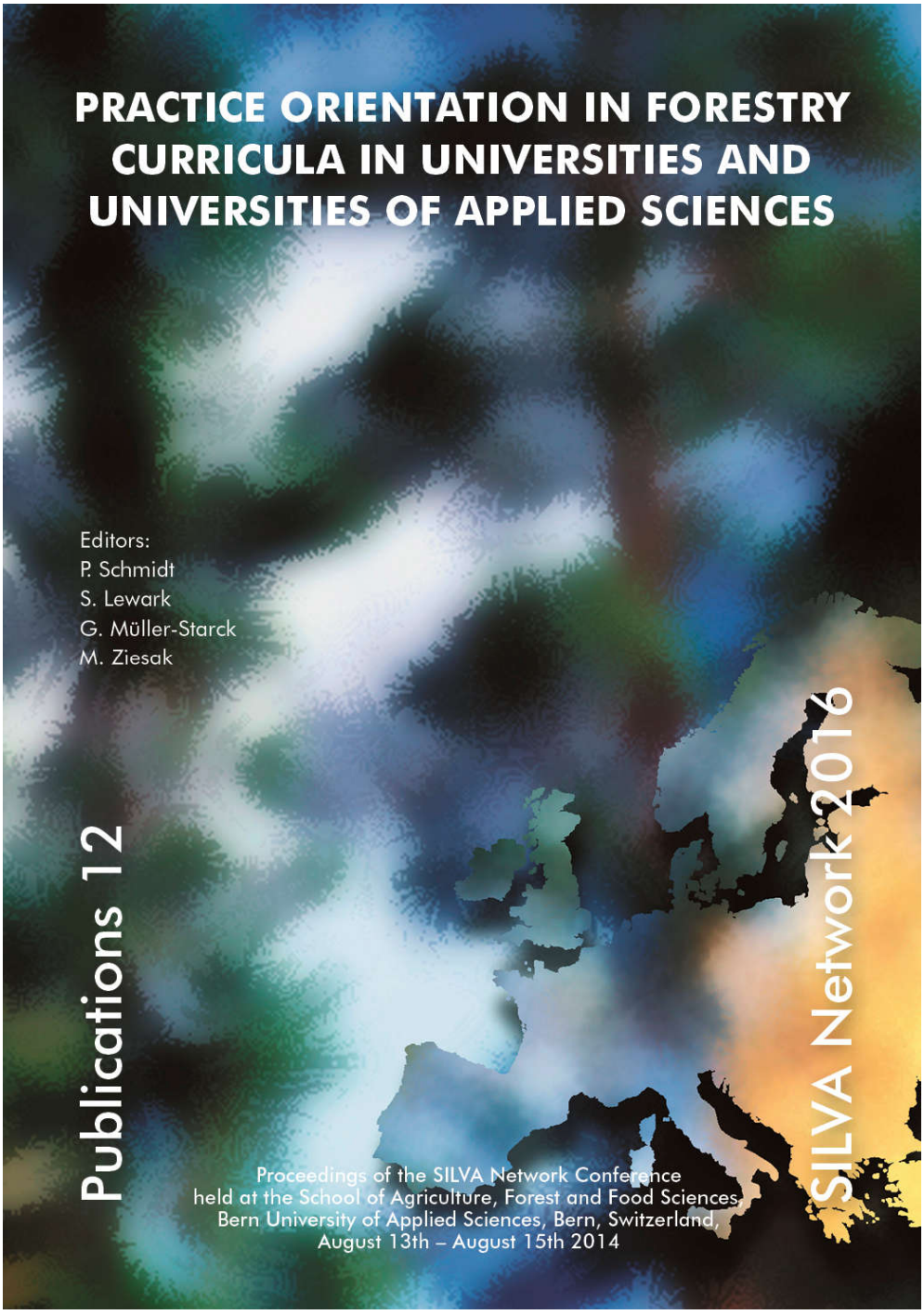
PRACTICE ORIENTATION IN FORESTRY CURRICULA IN UNIVERSITIES AND UNIVERSITIES OF APPLIED SCIENCES

Editors:
P. Schmidt
S. Lewark
G. Müller-Starck
M. Ziesak



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held at the School of Agriculture, Forest and Food Sciences,
Bern University of Applied Sciences, Bern, Switzerland,
August 13th – August 15th 2014

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PREFACE I

The SILVA Network has two good traditions: The first one is that the SILVA Network meets every year for a conference on forest sciences education. The second one is that the proceedings will be published in print and since a couple of year also on the SILVA Network home page. We, the editors, are proud to present you SILVA Publications 12, the proceedings of the SILVA Network meeting in Zollikofen (Bern, Switzerland) in 2014.

This 2014 annual conference was co-organised by SILVA Network, IUFRO Education Group and the Department of Forestry of the Bern University of Applied Sciences, each with its own speciality and its own knowledge.

The IUFRO Education Group indicates IUFRO's interest in education and as such is a natural partner of the SILVA Network

The Division of Forestry of the School of Agriculture, Forest and Food Sciences HAFL of the Bern University of Applied Sciences hosted this annual conference. This faculty – a young but enthusiastic member of the SILVA Network, playing an important role in the leading group of the SILVA Network now (Martin Ziesak serves as a vice-president now) –organised this meeting in an elegant way, both in the class room and in the field. We do remember two very interesting field excursions explaining courses given by HAFL, one on risks in an avalanche endangered area, walking the participants down very steep mountain, the second on teaching silviculture (see Rosset, this volume) in the nearby experimental forest, where it rained cats and dogs. No participants were lost!

This brings us to the most important participants, the speakers who turned into authors after the conference. Thanks to their creativity and energy and time input this volume came into existence. In many places of the texts the reader can feel the engagement of the authors for forestry and forest sciences education.

A much smaller group of teachers was involved in the quality assurance of this book. Four colleagues, acting as reviewers, reviewed the submitted papers and made suggestions for improvements.

These four, the editors, would like to say thanks to these two groups of persons: the organisers and the speakers and authors. Without them, this book would not exist.

The editors

PREFACE II

Forest sciences education is the critical basis for professional careers in our economic sector like in many others. The exchange of didactic knowledge and expertise allows for a common high level in academic forestry teaching.

It was therefore a great honour for the Division of Forestry at the School of Agriculture, Forest and Food Science (HAFL) of the Bern University of Applied Sciences (BFH) in Switzerland to become a member of the SILVA Network in 2014. In the same year, we organized the annual conference titled "Practice orientation in forestry curricula in Universities and Universities of Applied Sciences", in cooperation with the IUFRO education group. Some ideas in the following paragraphs are taken from the conference announcement. Practice orientation has been and still is a traditional attribute and strength in the forestry curricula, both at universities and at universities of applied sciences. It is an important part of the self-understanding of these institutions. But what does practice-orientation mean at the university level (in forestry)? In our opinion, practice-orientation certainly suggests that practical forestry knowledge needs to be included in teaching. However, practice-oriented learning and teaching is much more than just referring to practical problems. Learning and teaching in the forestry curricula needs to discuss the problems of practical forestry in a scientific context.
So how do we achieve this? Working on exemplary tasks from real work situations may be the way; in other words, problem-oriented learning. Furthermore, cooperating with forestry enterprises or other institutions working on forest related issues including research, and involving experts from the working world may help. Excursions, internships in organizations and doing assignments and theses based on practical tasks are other approaches that have proven their worth.

In order to reach these objectives, we need highly qualified and scientifically competent teachers with practical experience. Scientific competence allows them to put problems of practical forestry in a broader social, economic and ecological context. This provides the basis for research and development, thus renewing knowledge. Practical experience, on the other hand, gives the teacher the opportunity to combine theoretical knowledge with practical aspects.

While practice-orientation in forest sciences education is certainly important, it remains a challenge to implement. This is why, as a basis for exchange of experience, the SILVA Network is so important to us and why we at BFH proudly hosted the 2014 SILVA network conference here at Zollikofen.

Bernhard Pauli
Bern University of Applied Sciences

Participants of the SILVA Network conference in Zollikofen (Bern) in 2014 (photo Daniëla Rommel).

CONTENTS

SUMMARY

PRACTICE ORIENTATION IN FORESTRY CURRICULA IN UNIVERSITIES AND UNIVERSITIES OF APPLIED SCIENCES

PIETER SCHMIDT

Forestry has both scientific and practical aspects. Forest sciences, the other concept quite often used in SILVA Network discussions, has a clear meaning. Forestry education and the institutions offering forestry education have been struggling already a long time to find – in the framework of the actual requirements of the society – the right balance between the scientific and practical aspects.

In the SILVA Network conferences we discussed regularly issues related to this struggle to find a good balance between sciences and practice in forestry education. One could say it was and is permanently present, in every meeting, sometimes very much in the open (e.g. at Wageningen, 1987; 2005), sometimes more under the surface. During the 2014 annual meeting of the SILVA Network in Zollikofen it was the central issue.

SIEGFRIED LEWARK, in his introduction, states that practice orientation manifests itself in contents of study programmes, which include problems of practical forestry and – in a wider context – questions on the relationship between societies and forests. But practice oriented learning and teaching is much more than referring to practical problems. Learning and teaching processes in forestry curricula must lead to knowledge about these issues and competences of the graduates to solve practical problems in their later working life; accordingly education must be outcome oriented.

What does practice orientation in higher forestry education look like today? Is development going towards strengthening or weakening of practice orientation? Does practice orientation change with modifying occupational profiles? Which are the changing demands from society? Are there fundamental differences between universities and universities of applied sciences and between practice orientations at these institutions? Will specialisation occur, grow or diminish? Enough relevant issues to be discussed below.

Three universities presented their approach to practice orientation in their Bachelor programmes. TRON EID of the Norwegian University of Life Sciences, MICHAEL WEBER and GERHARD MÜLLER-STARCK from the Technische Universität München (Germany) and ANDREAS ROTHE from the University of Applied Sciences

Weihenstephan-Triesdorf (Germany) presented how their universities approached and handled this challenge.

TRON EID considered the practice orientation as one of the strengths of their BSc programme. However, practice oriented teaching is much more than handling practical problems in the field. The Bachelor's programme comprises a mixture of basic science courses, economic and social science courses and basic courses in forest ecology and management. In addition to the Master's thesis, only three courses (25 out of 120 ECTS credits) are compulsory (multi-disciplinary courses in forest management planning) in the Master's programme. This enables students to specialise in subjects such as silviculture, forest economics and planning, forest operations or wood technology.

The proportion of conventional teaching with "one way" communication from teacher to student has clearly been reduced over the past years while activities related to project assignments for individuals and groups, and to presentations and seminars became more important. An apparent observation is that many of these activities are practice and problem oriented. Two examples of such activities are provided here. The general impression from the teachers' perspective is that these teaching methods motivate the students and generally seem to provide an efficient learning platform.

TRON EID concludes that – although the students tend to wish even more practice orientation in their studies – the general feedback from graduated students who have experienced some years of work is different. At this stage, they appreciate the theoretical input and skills acquired as a fundament for adapting well to the practical work in their jobs.

MICHAEL WEBER and GERHARD MÜLLER-STARCK stated that during the last decade the practice of professional life of foresters has changed dramatically e.g. due to increasing size of forest districts, the separation of the centralized German State Forest Services into ´forest authorities´ with responsibilities of public administration and companies for the entrepreneurial management of the state forests, new societal requirements and regulations, and the progress of technology. The introduction of the ´European Higher Education Area´ and the consolidation of faculties together with the strong focus on research aspects in the appointment policy of professors have also changed the situation at the universities. Michael Weber and Gerhard Müller-Starck address some aspects of ´practice orientation´ from the view of the School of Forest Science and Resource Management of the Technische Universität München in the ongoing revision of the Bachelor programme. Starting point is the actual labour market. Some aspects are identical to the ones mentioned by Tron Eid.

The revised programme shall consider all and will include most of the requirements (e.g. including external instructors, cooperation with forest companies, practice

related lectures, activation of existing networks) that have been formulated in the Eberswalder Declaration to improve the practice orientation of higher education.

ANDREAS ROTHE describes the Bachelor programme “Forest Engineering” at the University of Applied Sciences Weihenstephan-Triesdorf (HSWT) in Freising, Germany. He states that practical orientation is a relevant component of this programme. Important factors to implement a practical approach into the 3.5 year programme include a ten week project “Forest Management” during the second year, an internship semester during the third year, 25 days of interdisciplinary practical training and a substantial number of projects, practical training, seminars or case studies within regular modules. ANDREAS ROTHE gives more details of these courses. Furthermore, a forest of 1500 ha adjacent to the faculty is at hand for teaching and all teaching staff has at least three years of professional background outside academia. Practical orientation is not a feature which is permanently guaranteed by a certain curriculum but rather an enduring development process. Close liaison with stakeholders from working life is pivotal to the success of this endeavour.

In their paper MICHAEL ALDER, FABIAN LEU and MARKUS PFANNKUCH discuss their view on the subject of international cooperation in higher education. All three were Swiss forestry students and graduated as Bachelors of Science in "Forest Science" and Masters of Science in "International Management of Forest Industries". The first is a Bachelor programme at the School of Agricultural, Forest and Food Sciences in Zollikofen near Bern and the second one is a cooperation between this school and the University of Applied Sciences Weihenstephan-Triesdorf in Freising, Germany. The first term of the MSc is taught in English in Bern, the second term taught in German is given in Freising. During the third term, a thesis is written in a company or in cooperation with an outside institution.

The authors state that international cooperation in higher forestry education is indispensable, not only between institutions, but also between students. However, it presupposes extra efforts on an organizational and educational level as well as a will for change of all involved parties. It also requires much perseverance as initial enthusiasm often faces various constraints. Unfortunately, most universities do not focus on international cooperation and additionally, the international network amongst lecturers seems to be astonishingly poor. The authors recommend that a course in International Forestry should be integrated in every BSc programme to broaden the students’ horizons. The authors also place emphasis on the use of English as compulsory working language in MSc programmes. When elaborating international programmes lecturers should inform each other frankly and fairly about their BSc programmes’ content and thus avoid unrealistic expectations of students’ knowledge. Finally, the authors encourage universities to give preference to lecturers with a broad international network and to encourage their student associations to join the International Forestry Students’ Association.

One course on silviculture was presented in detail by CHRISTIAN ROSSET, next two types of teaching courses were discussed. SIEGFRIED LEWARK discussed compact courses and CLAUS RAINER MICHALEK presented e-learning.

Teacher of silviculture CRISTIAN ROSSET thinks that close-to-nature and multiple-purpose silviculture is a challenging and demanding task considering the necessity to be able to take clear, well-grounded and convincing decisions in complex and uncertain environments in order to influence forest development. It requires not only good knowledge about forest ecosystems and the possibilities to influence their dynamics, but also practical skills to apply this knowledge. Decisions to influence forest development must account for the specificities of a given situation and its context. A major challenge in teaching silviculture is to derive a well-balanced mix of theoretical and practical approaches. At the School of Agricultural, Forest and Food Sciences (HAFL) of the Bern University of Applied Sciences (BFH) in Switzerland three courses have silviculture as main topic totalling 13 ECTS credits. The first is aimed at basic knowledge, the second at both forest management and a silvicultural management plan, and the third is a specialisation in silviculture. The teaching and learning concept in silviculture is illustrated on the basis of the first course.

At the end of this module, students should be able to elaborate a clear, well-founded and convincing silvicultural project for a given forest area likely to be submitted successfully to the forest owner and/or the forest service. The content of the silvicultural project basically encompasses the analysis of the forest area and the overall silvicultural targets, a silvicultural intervention concept and its subsequent stand intervention priority map, as well as its implementation by means of tree marking in the stands at the highest priority level. Three IT tools developed at BHFL for both research and teaching are used in the course. The examination of the module takes place in the forest at a location which has not been visited previously during the course. Each student has to individually make a plan and present it to the teachers and the forest owner. Both students and forest owners gave positive feedback.

E-learning at the University of Natural Resources and Life Sciences, Vienna refers according to CLAUS RAINER MICHALEK to an eighteen-year old history. What started as an ambitious attempt by early adopters has become an integral part of today's teaching and learning. The forestry curricula are no exception in this respect: three quarters of the courses of the Bachelor of Science programme "Forestry" use "BOKU learn", a learning management system based on "Moodle". Learning resources like PDF files form the backbone of the courses. Activities complete that offer in many and diverse ways, often reflecting the creativity of the teachers. Discussion forums can be found in nearly 30% of the courses of the bachelor programme "Forestry", the same applies to quizzes in the elective courses. Assignments and choices support the organisation in about 15% of the courses. Over the last five years lecture recording was established and covers 10% of this

programme. Since smartphones are widely used, mobile learning is about to become an addition to classical e-learning.

Achieving competences needed by professionals in their working lives may, according to SIEGFRIED LEWARK from the Faculty of Environment and Natural Resources of the Albert-Ludwig University in Friebug im Breisgau (Germany), be supported by compact study courses within and outside formal study programmes of higher education. These courses may be organised in different manners, either as block courses at home universities, or as summer schools located elsewhere, in forestry education often closely to the objects of learning. They may be limited to enrolled students or open to an international participation, implemented for the benefits of increasing competences or as a source of income for organising institutions. As in the case of any other teaching unit, the learning success in higher education will greatly depend on the applied didactical principles. The learning paradigm, in contrast to the instruction paradigm, uses a course organisation that relies on an active and self-responsible learner and focuses on the learning process. The learner, therefore, must have space and be motivated to self-organised learning. How to accomplish this in compact courses? To the greatest possible extent, learning would be conducted through working on particular cases, with experts as reference persons at hand. The role of the teacher is primarily to support and moderate the learning process. The assessment of results and outcome of learning should match the learning objectives. Examples are given and discussed.

SIEGFRIED LEWARK has shown that compact courses allow didactic approaches following the learning paradigm in an easy, natural and methodically inherent way. Principles of learning by applying research methods and of learning by doing, i.e. by working on practical tasks, are typical for compact courses. He recommends strongly to continue to offer compact courses and to develop new ones.

The aim of paper by ROLAND STÄHLI was to examine how reflecting on lessons influences the further development of the teaching practice. Shortly, the studied vocational school teachers' abilities to reflect on something can be described as diverse, broad, but not very well-structured. The teachers were committed to reflecting on their teaching style and generally have an open and positive attitude towards the concept of reflection. At the same time, it is emphasized that reflection is not easy without practicing. The study made clear that ability to reflect on something needs to be trained and encouraged extensively. Measures to do this can be appropriate instructions and aids (e.g. checklists and teaching journals), but also targeted training and further education courses. In addition, it appears to be sensible to reflect on collegial exchanges or coaching measures with which the effect of individual reflection could be increased. Improving teachers' abilities to reflect on something offers no guarantee for successful teaching, but it is a crucial prerequisite in order to make progress in everyday professional teaching in a conscious, targeted and knowledge-driven way.

At the end of the meeting a short but intensive free discussion on the main topic of the meeting – practice orientation of the curricula – was held with all participants. No general conclusion was striven for, neither obtained. However, nearly all participants contributed to the discussion. SANNE VAN DEN BERGE and LOTTE VAN NEVEL report that the core of the discussion was 'What are the core competences of 'classic' universities versus universities of applied sciences?' It is evident that changing requirements should be reflected in the curricula. Participants were concerned about the broad forestry education (generalist) as compared to smaller ones (specialist). They concluded: universities of applied sciences solve the problems of today and tomorrow, whereas 'classic' universities solve the problems of tomorrow and after tomorrow. Both are needed. Moreover, students will choose with their feet. This means also that the discussion on the balance between science and practice in forestry education will continue.

In his concluding remarks SIEGFRIED LEWARK formulated three questions: How to translate practical orientation into expected learning outcomes – and how to achieve these? And then: Are there fundamental differences between universities and universities of applied sciences in this respect? During the conference a number of answers were given. Based on these answers, SIEGFRIED LEWARK found it confirmed that practice orientation is fundamental, both at universities and universities of applied sciences. The courses discussed here were mostly problem oriented, working on tasks and aiming at elaborating results, which are presented to peers, teachers and often also to practitioners; the reason mentioned for offering these courses is preparation for practical working life.

No clear differences between universities and universities of applied sciences can be found in the texts but there are clearer differences between Bachelor and Master curricula in each of these institutions. SIEGFRIED LEWARK found, however, a greater share of compulsory courses in the Bachelor programmes, whereas differences of didactical approaches between Bachelor and Master were not large.

INTRODUCTION

PRACTICE ORIENTATION IN FORESTRY CURRICULA IN UNIVERSITIES AND UNIVERSITITES OF APPLIED SCIENCES

SIEGFRIED LEWARK

Practice orientation has been and still is a traditional attribute and strength of forestry curricula, both at universities and at universities of applied sciences. It is an important part of the self-understanding of these institutions, which probably did not very much change with the curriculum development under the Bologna Process.

Practice orientation certainly shows in the first place in contents of study programmes, which include problems of practical forestry and in a wider context questions on the relationship between societies and forests. But practice oriented learning and teaching is much more than referring to practical problems. Learning and teaching processes in forestry curricula must lead to knowledge about these issues and competences of the graduates to solve practical problems in their later working life; accordingly education must be outcome oriented.

How to get there? Working on exemplary tasks from real working situations may be the way, in other words problem oriented learning. Cooperation with forestry enterprises or other institutions working on forest related issues including research may help, also involving experts from working life. Excursions as well as internships in these organisations and doing assignments and theses based on practical tasks are other approaches, which have proven their worth.

What does practice orientation in higher forestry education look like today? Is development heading for strengthening or weakening of practice orientation? Does practice orientation change with modifying occupational profiles? Which are the changing demands from society? Are there fundamental differences between universities and universities of applied sciences and between practice orientations at these institutions? Will specialisation occur, grow or diminish?

These questions are resuming some issues of earlier SILVA Network conferences (for inspiration and reminding see www.silva-network.eu). They are specially adequate for the conference of 2014, as it or organised for the first time at a University of Applied Sciences, after SILVA Network decided to invite Universities of Applied Sciences offering master programmes to join the network as members.

PRACTICE AND PROBLEM ORIENTED TEACHING IN NORWEGIAN FOREST SCIENCE PROGRAMMES

TRON EID

Abstract
The aim of this paper is to provide a description of the forest science programmes at the Norwegian University of Life Sciences, and to discuss them in a context of practice orientation and problem oriented teaching methods. The Bachelor's programme comprises a mixture of basic science courses, economic and social science courses and basic courses in forest ecology and management. In addition to the Master's thesis, only three courses (25 out of 120 ECTS credits) are compulsory (multi-disciplinary courses in forest management planning) in the Master's programme. This enables students to specialise in subjects such as silviculture, forest economics and planning, forest operations or wood technology.

The proportion of conventional teaching with "one way" communication from teacher to student has clearly been reduced over the past years while activities related to project assignments for individuals and groups, and to presentations and seminars, are given more focus. An apparent observation is that many of these activities are practice and problem oriented. Two examples of such activities are provided here. The general impression from the teachers' perspective is these teaching methods motivate the students and generally seem to provide an efficient learning platform.

Key words: Norway, higher forest education, teaching methods, practise orientation.

Introduction

In Norway, we have two institutions providing higher education in forest science; Norwegian University of Life Sciences with Bachelor's and Master's programmes and Hedmark University College with a Bachelor's programme. A total of 30 to 40 students graduate annually from the two Bachelor's studies while 15-20 students graduate from the Master's studies.

Practice orientation is still, also after the Bologna Process, an attribute and strength of many forest science programmes around Europe, including Norway. The practice orientation does of course materialise as contents of the study programmes. However, practice oriented teaching is much more than handling practical problems in the field. We also need to deal with teaching and learning in a wider context considering the relationships between the graduated professionals, the forests and the society. This means that the education must be outcome oriented. How can we

get there? Working on cases from real situations by means of problem oriented teaching maybe one way.

The aim of this paper is to provide a short description of the forest science programmes at the Norwegian University of Life Sciences, and to discuss them in a context of practice orientation and problem oriented teaching methods. We will provide examples of how we approach practical forestry issues and problem oriented learning at different levels in our programmes, and discuss some challenges we face in higher forest science education in Norway.

Forest science programmes in Norway

Learning is a continuing process that can be illustrated as a "stairway to knowledge" where the students acquire increasingly higher knowledge levels (Figure 1). At the lowest level, the students should be able to repeat the knowledge, but they do not necessarily have any in-depth understanding of the topic at this stage. As the students learn more and go deeper into the topic, they should be able to explain, apply and analyse the knowledge, and towards the end of a graduate study, even be able to synthesise and evaluate, and put all the knowledge into a wide context. Although the "stairway to knowledge" is a theoretical approach to the learning process, it may be useful, both when developing individual courses and when developing a programme, to ask a very basic question: which level in the "stairway to knowledge" should we aim for just now?

When building the forest science programmes at the Norwegian University of Life Sciences over the past years we have actively used this approach as template to facilitate an appropriate learning progress for the students. The Bachelor's programme of course mostly deals with the lower levels, but the aim is to climb the stairway step by step. At the end of the Bachelor's programme, most students have reached a level where they are able to properly analyse quite complex issues in forestry. The learning environment and teaching methods at Master's level mainly assumes that the students have sufficient basic skills to analyse, synthesise and even evaluate forestry issues in economic, social and environmental perspectives. However, if we really have succeeded in this respect is subject of numerous discussions among teachers in our department.

The Norwegian forest science programmes have changed substantially over the past 15 years (see e.g. Fitje, 1998). However, the Bachelor's programme (Table 1) given at the Norwegian University of Life Sciences is still built up in the traditional way as seen in many other Life Sciences Universities elsewhere in Europe. There is a mixture of basic science courses (Mathematics-MATH, Statistics-STAT, Chemistry-CHE, Soil Science-SOIL), economic and social science courses (Micro Economy-ECON, Philosophy-PHI, Law-LAW) and of course basic courses in Forest Ecology and Management. The latter include Forest Biology, Ecology and Production (FOR200), Resource Mapping and Inventory (FOR205), Forest

Products and Wood Technology (FOR210), Treatment and Production of Forest Stands (FOR220), Resource Economics and Planning in Forestry (FOR230) and Forest Engineering and Logistics (FOR240).

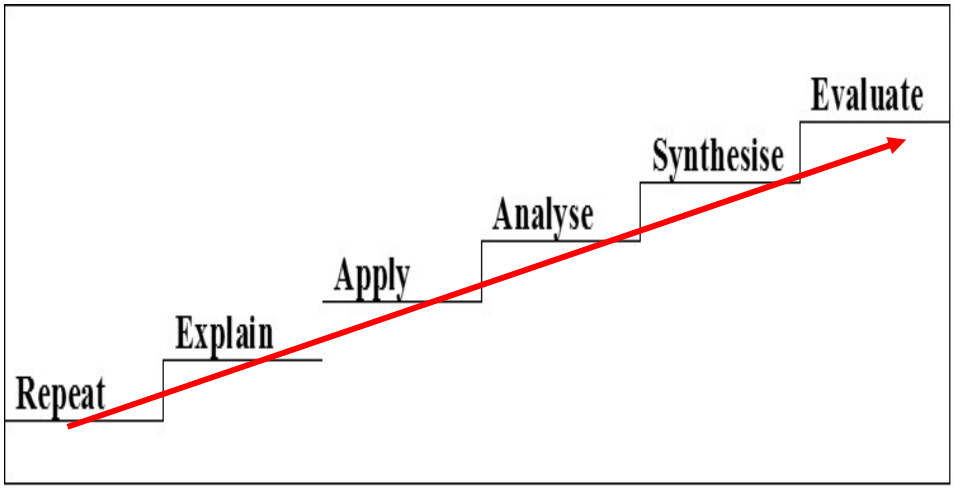

Figure 1. Stairway to knowledge: from reproduction to reasoning (modified from Engelhart *et al*., 1956).

The Bachelor's programme also starts with a multi-disciplinary course (FOR100 – Forest Management), which "touches" into all the forestry related subjects. The main aim of this course is to introduce and motivate the students for further deepening in forest science. The programme ends with a course (FOR250 - Forest Management, Interdisciplinary Analysis), where the students perform comprehensive analyses applying the skills they have achieved in a multi-disciplinary and practical context. Both these multi-disciplinary courses are oriented towards the practice in forestry and carried out within a problem oriented learning environment. Further details on these courses are given below.

While the Bachelor's programme provides only limited freedom of choice for the students, the Master's programme is much more open (Table 2). In addition to the Master's thesis, only three courses (with 25 out of 120 ECTS credits) are compulsory in this programme; two multi-disciplinary courses in forest management planning (FOR300 – Forest Planning, FOR302 - Multiple Use of Forests) and one course in leadership (LEAD230 - Psychology of Organization and Leadership). The relatively few compulsory courses enable the students to specialise in one of the following subject areas: Silviculture, Forest Resource Economics and Planning, Forest Operations or Wood Technology.

Table 1. Bachelor's programme: Forest Sciences (NMBU 2015a). ECTS here used in the meaning of ECTS credits.

Year	Semester	5 ECTS	10 ECTS	15 ECTS	20 ECTS	25 ECTS	30 ECTS
3	June block	FOR250 - 10 ECTS					
	Spring parallel	FOR 230					
	January block	NAT200 - 5 ECTS					
	Autumn parallel	FOR 220	FEP 202				
	August block	FOR220 - 5 ECTS					
2	June block	FEP201 - 5 ECTS					
	Spring parallel	FOR 210	FOR 240		ECON 100		
	January block	FOR210 - 5 ECTS					
	Autumn parallel	PHI 100		GIS 102	SOIL 101	FOR 205	LAW 100
	August block						
1	June block	FOR101 - 5 ECTS					
	Spring parallel	STAT 100		CHE 100		FOR 200	ECOL 100
	January block						
	Autumn parallel	FOR 100	MATH 100		ECON 110		
	August block	FOR100 - 5 ECTS					

Note: Courses at 100-level are basic courses while courses at 200-level are medium advanced courses. Courses with high numbers generally build on courses with lover numbers. The number of ECTS for courses given in spring and autumn parallels are indicated by the columns at the top of the table while the number of ECTS for courses given in August, January and June blocks are given directly for each course. White fields are open for elective courses. The total number of required ECTS for the Bachelor's programme is 180.

Table 2. Master's programme: Forest Sciences (NMBU 2015b). ECTS here used in the meaning of ECTS credits.

Year	Semester	5 ECTS	10 ECTS	15 ECTS	20 ECTS	25 ECTS	30 ECTS
2	Spring parallel	MASTER'S THESIS					
	January block						
	Autumn parallel	FOR 302					
	August block	LEAD230 - 5 ECTS					
1	June block						
	Spring parallel						
	January block						
	Autumn parallel	FOR 300					
	August block						

Note: Courses at 200-level are medium advanced courses while courses at 300-level are advanced courses. Courses with high numbers generally build on courses with lover numbers. The number of ECTS for courses given in spring and autumn parallels are indicated by the columns at the top of the table while the number of ECTS for courses given in August, January and June blocks are given directly for each course. White fields are open for elective courses. The total number of required ECTS for the Master's programme is 120.

Generally, the Bachelor's programme qualifies for practical and administrative positions related to the forest sector. The majority of the students, however, continue into Master's studies, most of them in forest sciences, but also some in related fields (e.g. Management of Natural Resources, Resource Economics). The Master's programme qualifies for leading positions in public and private management, and in organizations and industries. Some students also go into teaching or start their own business (often as farmers), or continue with doctoral studies.

Teaching methods and practice orientation

Teaching methods

Teaching methods may be described as ways to present information to students, while learning strategies are more about how the students study, i.e. the teaching methods are more about what the teacher does and the learning strategies are more about what the student does. In the following, we mainly focus on the first perspective.

The methods we apply when teaching forest science at the University of Life Sciences may broadly be divided into the following categories;

- Lectures;
- Field exercises;
- Excursions;
- Project assignments;
- Presentations and seminars.

Field exercises, where the students are trained in practice oriented basic skills, have traditionally been very important within forestry education. The same applies to excursions where forests, forest owner and forest industries are visited. The proportions of these activities among the different teaching methods are probably at the same level as they were 10-15 years ago. The proportion of conventional teaching with "one way" communication from teacher to student, however, has clearly decreased over this period. An estimate would be that teachers now spend less than half of their time on conventional lecturing. Instead, activities related to project assignments for individuals and groups, and maybe in particular to presentations and seminars, take more time for the teachers as well as for the students. An apparent observation is that many of these activities are practice and problem oriented. In the following, we provide two examples of such activities.

Examples of practice and problem oriented teaching methods

Example 1: Help me, I have inherited a forest property!
This assignment is given to the students on their first day as Bachelor's students, i.e. when they arrive at the university. The assignment has to be solved over a period of two weeks as part of the basic multi-disciplinary course (FOR100, see Table 1). The students work in groups of three and each group gets an individual text (case). The "core" of all cases is an inquiry from a person to the "consultancy team" for advice regarding what to do with a forest property that he/she suddenly has inherited. A short text on the background of these persons (hometown, family situation, education, age, etc.), location (cases from all over Norway) and resources of the property (small to large forest properties combined with agriculture or other nature based resources) is given. The text is open and the students by themselves have to "fill in" many assumptions to supplement the description of the situation. The students are intentionally given only limited supervision during the early phases of the two-week period. Other teaching activities including a three-days field excursion (where they may get good ideas for how to approach the assignment) also take place in this period. A written report and an oral presentation of the findings and recommendations are finalising the exercise. The assignment is marked on a scale from A to F.

To deal properly with a complex task like this actually requires skills covering all levels of "the stairway to knowledge" (Figure 2, dotted circle). It is quite obvious that the students at this stage do not have sufficient background to deal with this.

However, one of the objectives of this exercise is to make the students "understand that forest science is complex and realize that they need to learn much more about forestry before they can properly deal with a task like this". Many of the students get frustrated in this process, but as they proceed and advance in their thinking and reasoning, they also in the end seem to appreciate what gets out of it and learn from the exercise. It is also remarkable too see what the students in the end are able to come up with regarding facts and reasoning. They also get experience from group work, and this is very important for similar exercises coming up later in the programme.

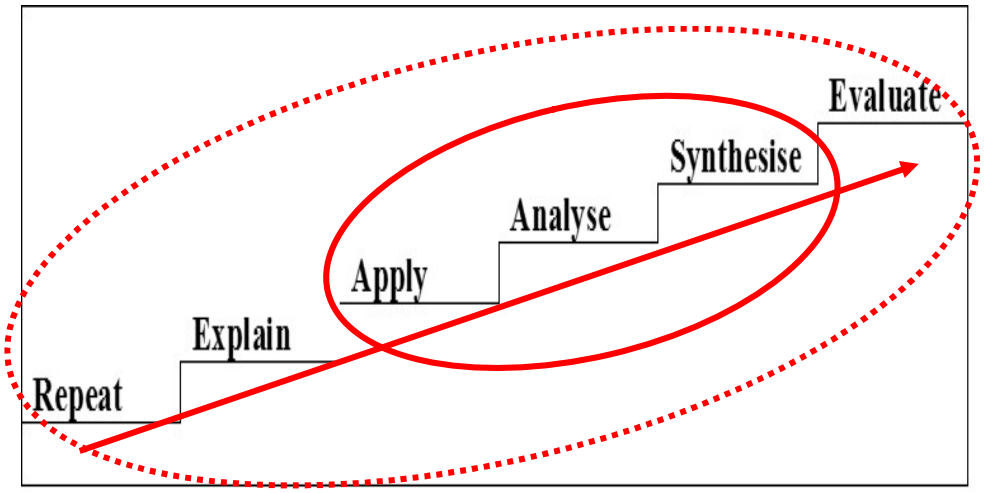

Figure 2. Stairway to knowledge (dotted circle – example 1, solid circle – example 2).

Example 2. Interdisciplinary analyses – management advices

The last four weeks of the Bachelor's study a course in interdisciplinary analysis is given (FOR250, see Table 1). The main aim of the course is to familiarize the students with situations popping up when they "in real life" are supposed to provide management advices to forest owners. The exercise takes place on a selected forest property with an interested forest owner willing to share data and information with the students. Normally we shift to a new property every second year. The selected properties vary in size (200-300 hectare) and the forest production is usually combined with agricultural production and/or regular jobs outside the property. The number of students attending the course is normally 15-20 and they work in groups of 3-4 students. The students get access to documents describing the present conditions of the forests resources both at stand and property level including a forest map with delineated stand boundaries. A meeting is arranged with the forest owner where information about property resources, family situation, different incomes sources and general production and income objectives is provided based on questions from the students.

The general assignment of the students is to give advices to the forest owner on the management of the forest resources. Short and long term advices at both stand and property level, including ecological as well as economic considerations and analyses, are given. Approximately half of the time is spent in the field collecting additional information and data while the remaining is spent in the computer lab. The students have to disseminate their finding and advices in two different ways:

- Provide the forest owner with a written report;
- Organize and carry out a field excursion on the property with the forest owner, local forestry professionals and teachers as audience.

This exercise is finalising the Bachelor's programme, and the students are expected to demonstrate that they are able to apply, analyse and synthesise the skills and knowledge (Figure 2, solid circle) they have been exposed to during their studies. The general impression is that most students really are able to demonstrate such skills. This is also, however, an exercise where some students clearly demonstrate that they have been exposed to challenges they do not master. Generally, we get very positive feedback from the students on this course. The students feel they have reached a level where they are able to apply and synthesise what they have learned over these three years. They also appreciate the "real world situation" they have been exposed to through the exercise.

Concluding remarks

Practice orientation and problem oriented teaching and learning methods are essential elements of the forest science programmes at the Norwegian University of Life Sciences. Practice orientation and problem oriented teaching methods are also motivating for the students and generally seem to provide an efficient learning platform. The proportion of such activities among the different teaching methods has increased over the past 10-15 years. With this background, however, it is also timely to mention two aspects to be considered. First, such activities are resource demanding, which is a dilemma for the teachers, who in addition are supposed to carry out research. Secondly, it is a general impression among the teaching staff that challenges related to a weak theoretical background are larger than challenges related to lack of practice orientation. Although the students tend to wish even more practise orientation in their studies, the general feedback from graduated students that have experienced some years of work is different. At this stage, they appreciate the theoretical input and skills acquired as a basement for adapting well to the practical work in their jobs. We should therefore probably not increase activities related to practice orientation further on the expense of the basic science courses in our forest science programmes.

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CONTEMPORARY UNDERSTANDING OF PRACTICE ORIENTATION – A VIEW FROM THE SCHOOL[1] OF FOREST SCIENCE AND RESOURCE MANAGEMENT OF THE TECHNISCHE UNIVERSITÄT MÜNCHEN

MICHAEL WEBER AND GERHARD MÜLLER-STARCK

Abstract
In the last decade the practice of professional life has changed dramatically e.g. due to increasing size of forest districts, the separation of the centralized German State Forest Services into ´forest authorities´ with responsibilities of public administration and companies for the entrepreneurial management of the state forests in view of new societal requirements and regulations, and the progress of technology. The introduction of the ´European Higher Education Area´ and the consolidation of faculties together with the strong focus on research aspects in the appointment policy of professors have also changed the situation at the universities. In our presentation we will address some aspects of ´practice orientation´ from the view of the School of Forest Science and Resource Management of the Technische Universität München. Main focus is the current job market and its impacts on the revision of the Bachelor curriculum.

Keywords: BSc curriculum, forest science, soft skills, job marked, graduate employment

Introduction

According to the Magna Charta Universitatum (Anonymous, 1988) signed by 388 vice-chancelors and heads of universities all over Europe in Bologna in 1988, university research and teaching must be inseparable and independent of political authority and economic power. The independence and autonomy of universities is necessary to familiarize the students with the cutting edge level in their profession and thus to ensure that higher education enables them to adapt to changing environmental, economic and societal needs as well as advances in science. This requires that university education must go beyond referring to the current status of practical technology and problems and has to be flexible and innovative.

Aspects of the current job market

Today´s job market in the forest and timber industry sector is characterized by:

- Temporary employment with frequently changing tasks;

[1] Due to the Matrix structure of the TUM School of Life Sciences Weihenstephan, the official denomination is “Study Programme Division”.

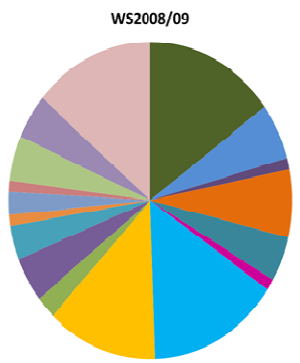
- ´Atypical´ tasks (e.g. real estate or facility management, public relations,);
- High portion of self-employment/consulting.

Even the traditional career of forest graduates has changed and continues to change at a rapid rate due to:

- Separation between forest authority and forest management;
- Outsourcing of many tasks (inventories, site mapping, monitoring);
- New societal requirements and regulations (nature conservation, education for sustainable development);
- Progress of technology (GIS, Apps, communication technology).

As a consequence, also the expectations of the students are changing rapidly: their vision about the future field of professional activity is under a steady change according to the situation on the job market (Figure 1). Consequently, university education has to be flexible and to find a balanced approach to equip the students with all competences that might be required by the future job market, which is very broad (Figure 2). Higher education has to conciliate the following aspects:

- Expert knowledge versus social key competences.
- Theoretical background versus practical skills and experiences.



	WS2008/09	WS2013/14
State forest service	15%	42%
Wood industry, Paper and pulp industry	6%	7%
Research	1%	13%
International forestry	7%	3%
National park	5%	2%
Private forestry	1%	2%
Nature conservation, NGOs	15%	6%
In the forest/in nature	13%	12%
Renewable resources	2%	2%
Development cooperation	5%	0%
Forestry in general	3%	0%
Private economy	1%	0%
Insurance and finance	2%	0%
Extractive and waste industry	1%	0%
Enterprises	5%	0%
Consulting	5%	0%
Management	0%	1%
Renewable energies	0%	1%
Forest pedagogics	0%	6%
Uncertain	14%	3%

Figure 1: Result of the interviews of the freshmen (1st year BSc students) in 2008/09 and 2013/14 about their intended field of professional activity after graduation.

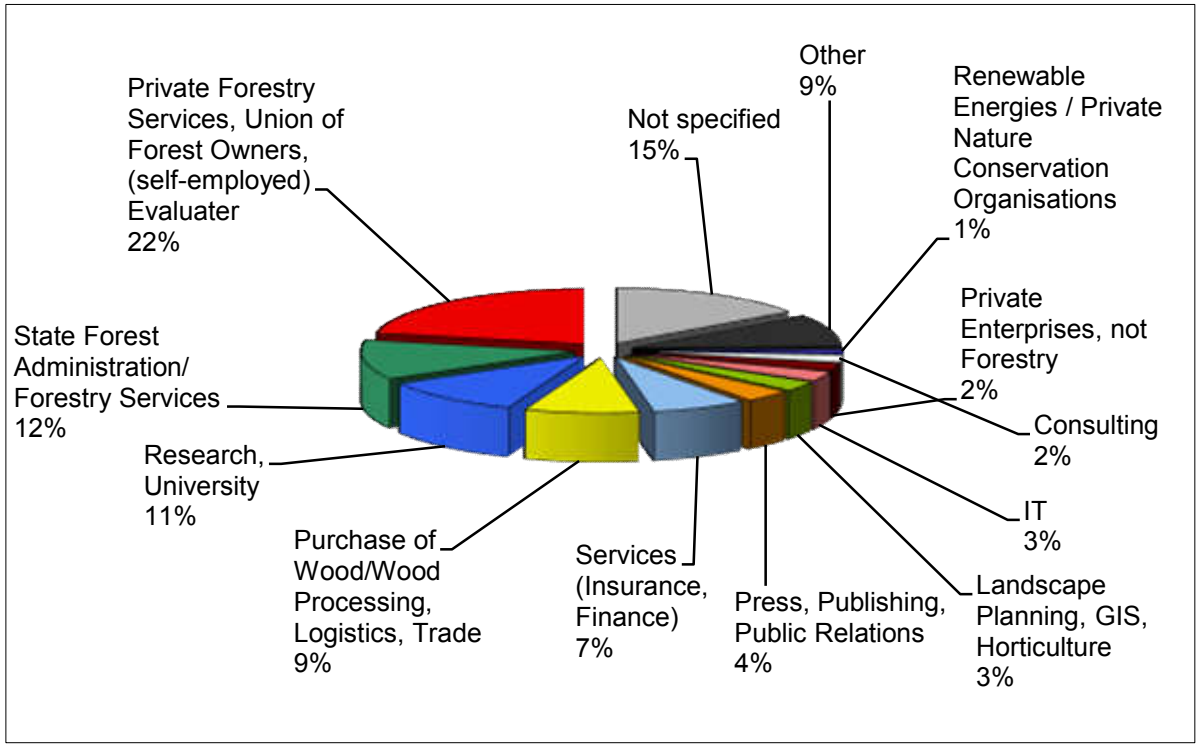


Figure 2: Real sectors of employment of the graduates in Forest Sciences (Data from employment study 2005, School of Forest Science and Resource Management).

Thus, universities should permanently check for which kind of ´practice´ they want to educate their graduates: jobs in the traditional forest service, in the fields of nature conservation, in development cooperation, in timber industry, or in consulting? Therefore we offer our students a curriculum with a broad foundation in natural sciences and courses that cover the whole range of possible job opportunities. Furthermore, the curriculum includes a divers set of elective courses and projects which allows the students to develop individual profiles and to achieve a certain specialization according to their own job preferences.

Current challenges for forest faculties: the teacher matters

Today, the before mentioned freedom of universities is restricted by several factors:

- Introduction of the ´European Higher Education Area´, especially the many formal aspects linked with accreditation and quality assurance (e.g. fixed module sizes, limited number of exams per semester, predefined examination types).
- The comprehensive set of key competences defined by the Conference of the Directors of the German State Forest Services required for the acceptance for traineeship in State Forest Services. To fulfil these requirements a high proportion of courses in the bachelor curriculum has to be obligatory, which is partly in conflict with the accreditation requirements used in the Bologna process.
- Consolidation of the forest faculties with other faculties, like e.g. geography, environmental sciences, or life sciences. As a consequence, many courses are taught by professors from other professions who do not have any experiences or a background in forestry.
- Human resources development, e.g. the appointment policy of professors which is preferably based on scientific excellence and highly specialized research aspects instead of teaching requirements and skills as well as practice-related experiences. To prepare the students for their career the teachers should have an own idea about the multiple challenges of professional life.

Solutions at the School of Forest Science and Resource Management of TUM

To cope with the described situation the is actually under revision. Although the present curriculum (Figure 3) is already quite flexible and considers multiple requirements of up to date higher university education the revised programme will involve an enhanced portfolio of learning formats (student presentations, individual and group work, blended learning, case studies), teaching formats (seminars, exercises, tutorials, practical courses, project work, workshops) and will be more directed towards conveying methodological knowledge and skills. At the same time a strong focus will be on awakening awareness for current problems, on creation of cooperation and integration of interdisciplinary and transdisciplinary issues.

<table>
<tr><th>1st Semester (WS)</th><th>2nd Semester (SS)</th><th>3rd Semester (WS)</th><th>4th Semester (SS)</th><th>5th Semester (WS)</th><th>6th Semester (SS)</th></tr>
<tr><td>Chemistry 6 CP</td><td>Characteristics of Wood and other Renewable Raw Materials 5 CP</td><td>Natural Resources: Soil and Vegetation 5 CP</td><td>Forest Sites 5 CP</td><td>Forest Management Planning 5 CP</td><td rowspan="2">Internship 10 CP</td></tr>
<tr><td>General Education Subject 4 CP</td><td>Inventory 5 CP</td><td>Economics and Industrial Law 5 CP</td><td>Forest Operations and Logistics 5 CP</td><td>Forest and Environmental Policy 5 CP</td></tr>
<tr><td colspan="2">Introduction to Economic Sciences 5 CP</td><td>Introduction to Forest Economics 5 CP</td><td>Criminal, Civil and Public Law 5 CP</td><td>Landscape Development 5 CP</td><td rowspan="2">Bachelor´s Thesis 10 CP</td></tr>
<tr><td colspan="2">Dendrology 5 CP</td><td>Forest Growth and Environment 5 CP</td><td>Silviculture 5 CP</td><td>Resource Markets and Quality Assurance 5 CP</td></tr>
<tr><td colspan="2">Eco-Climatology 5 CP</td><td>Technology and Utilization of Wood 5 CP</td><td>Technology and Utilization of Non-Wood Biogenic Resources 5 CP</td><td>Informatics and Introduction to Scientific Work 5 CP</td><td>Project 5 CP</td></tr>
<tr><td>Mathematics I 5 CP</td><td>Mathematics II 5 CP</td><td rowspan="3">Animal Ecology 5 CP</td><td rowspan="3">Forest Protection 5 CP</td><td rowspan="3">Required Elective Optional Courses 5 CP</td><td rowspan="3">Required Elective Optional Courses 5 CP</td></tr>
<tr><td>Biology I 5 CP</td><td rowspan="2">Physics 5CP</td></tr>
<tr><td>Biology II 5 CP</td></tr>
</table>

Elective Course Options (three courses are compulsory, 5 CP each):

Introduction to Geoinformatics	Fish Biology and Aquaculture	Phytomedicine of Wood Plants	Introductions to Forest Genetics	International Forestry	Renewable Resources: Breeding and Plantation Technology	Element Cycling in Forest Ecosystems	Education Tools in Forest Nature Conservation I	Education Tools in Forest Nature Conservation I

Figure 3: Present curriculum of the Bachelor programme.

At TUM the development of the generic competences (like leadership, teamwork capacity or communication competences) will be strengthened by an adequate arrangement of the courses (e.g. more group work, participatory training, student presentations). Furthermore, the university will also offer corresponding special courses, but on a voluntary basis.

The revised programme shall consider most of the requirements that have been formulated in the Eberswalder Declaration (Anonymous, 2013) to improve the practice orientation of university education (see Table 1).

Table 1: Requirements for improved practice orientation.

Requirement	Fulfilment	Method
Pre-study practical training	TUM (not applicable)	Not required for enrolment
Including external instructors	TUM (✓)	From industry, government, NGOs
Cooperation with forest companies	TUM (✓)	University forest as training ground, excursions
Practice related lectures	TUM (✓)	Case studies, projects, practical exercises
Exercises in small groups	TUM (✓)	Student moderated presentations and discussions
Activation of existing networks	TUM (✓)	Forest enterprises, alumni
Extend regular study period	TUM (✓)	

Conclusions

- Universities need to find a balance between academic freedom and requirements of the job market and forest practice.
- To enable the graduates to manage the manifold risks and challenges for the existence of forests and the provision of products and services derived from them as well as for forest enterprises, university education must impart competences and methods based on natural and social sciences.
- The understanding of ´practice orientation´ cannot only be restricted to the activities within the traditional forest services but must also consider jobs in other fields that require forest expertise.
- Major problems arise from the partial incompatibility between the high amount of key competences required by the forest services and the accreditation criteria used in the Bologna process (e.g. fixed module sizes, limited number of exams per semester, predefined examination types, integrated mobility windows etc.).
- Options to improve practice orientation are cooperation with employers, inclusion of external instructors and providing access to training grounds (like university and demonstration forest).
- Professional life requires flexibility and innovative capacity: this must be reflected in the ideas behind the study programmes.

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BACHELOR OF FOREST ENGINEERING AT THE UNIVERSITY OF APPLIED SCIENCES WEIHENSTEPHAN-TRIESDORF: AN EXAMPLE OF PRACTICAL ORIENTATION

ANDREAS ROTHE

Abstract
Practical orientation is an important component of the Bachelor programme "Forest Engineering" at the University of Applied Sciences Weihenstephan-Triesdorf (HSWT) in Freising, Germany. Important factors to implement a practical approach into the 3.5 year programme include a ten week project "Forest Management" during the second year, an internship semester during the third year, 25 days of interdisciplinary practical training and a substantial number of projects, practical training, seminars or case studies within regular modules. Furthermore, a forest of 1500 ha in size adjacent to the faculty for teaching is at hand and all teaching staff has at least three years of professional background outside academia. Practical orientation is not a feature which is permanently guaranteed by a certain curriculum but rather an enduring development process. Close liaison with stakeholders from working life is pivotal to the success of this endeavour.

Keywords: Bachelor forest engineering, practical orientation, professional higher education

Introduction

Besides classical "academic higher education", a distinct sector of academic education with special focus on practical aspects is gaining importance in many European countries. Often this sector is dubbed as "professional higher education (PHE)". Although there is no exact definition of PHE (and there is a wide variety of institutions offering PHE) including a strong focus on practical application and employability, a curriculum emphasising practical aspects and extended phases of practical experiences in the form of internships and/or work experiences are core elements of PHE (Figure 1).

In Germany, the "Fachhochschulen" are typical representatives of PHE. Most of the "Fachhochschulen" started during the 1970s and focused on professional academic training. Since then there was a powerful development both in an increase in the number of students and the profile of the "Fachhochschulen". This development was reflected by a change in denomination and nearly all "Fachhochschulen" converted to "Hochschulen für angewandte Wissenschaften" (Universities of Applied Sciences). The new term reflects that Universities of Applied Sciences offer academic training at the Bachelor and Master level and perform applied

research. In Germany currently about one third of all students of tertiary education are enrolled at Universities of Applied Sciences with a further increase predicted.

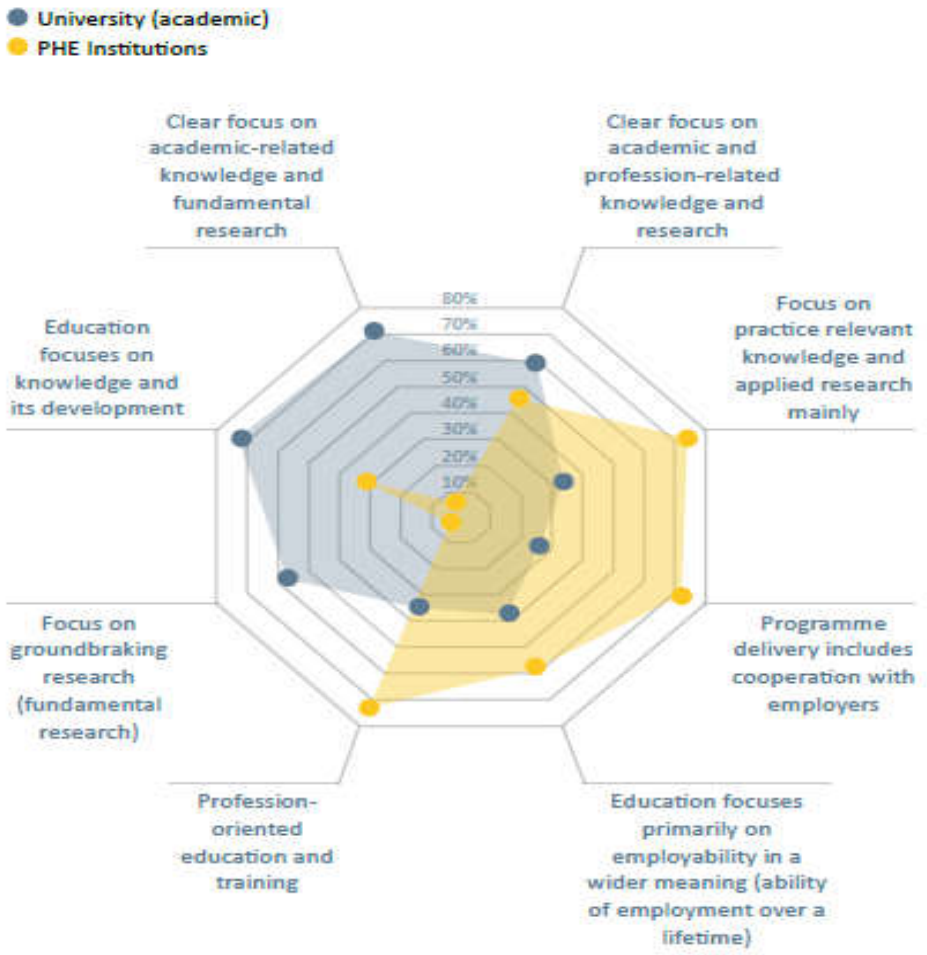

Figure 1: Self-image of academic and professional higher education. PHE means professional higher education (see text). Source: Grdošić and Tannhäuser, 2014.

The "University of Applied Sciences Weihenstephan-Triesdorf (HSWT)" is a typical example of such a school. Founded in 1972 as "Fachhochschule Weihenstephan", it experienced a steady rise of student numbers and currently 6300 students are enrolled at three campuses in Freising, Triesdorf and Straubing. The HSWT currently offers 19 Bachelor degree programmes and 11 Master degree programmes including four international programmes. The HSWT is orientated towards green subjects and degree programmes in biotechnology, food technology, horticulture, landscape architecture, renewable energies, agriculture and forestry and covers nearly any field which deals with nature, food, or the environment, respectively. Typical for a University of Applied Sciences is the direct practical relevance and sound scientific basis of the education it provides. It is part of its

philosophy to educate and train students for opportunities in a variety of occupations, thereby also meeting the needs of the labour market, including industry and business (HSWT, 2015).

The faculty of forestry is one out of seven faculties of the HSWT. Concerning the number of students, the bachelor programme "Forest Engineering" is the main programme of the faculty with about 500 students enrolled. Practical orientation is a key characteristic of the programme "Forest engineering". The aim of this contribution is to give a short overview of this programme and to present practical examples of how this orientation is implemented.

Curriculum for the degree of Bachelor in "Forest Engineering"

Within the Bologna process it was necessary to convert the former programme "Diplom-Ingenieur (FH)" into a Bachelor programme. According to the guidelines from the Bavarian Ministry of Education, the duration of a Bachelor programme at an University of Applied Sciences is 3,5 years (7 semesters). Since employability is a main target of professional education at Universities of Applied Sciences, it seemed straightforward to develop the curriculum in collaboration with the "world of work", taking into account the future needs of the practice and the context of employment. Thus we started curricula development in 2007 with a workshop with potential employers from private and public forest companies, forest administration, forest owner associations, forest industry, NGO´s, private consultants and contractors. The participants agreed that the Bachelor degree in Weihenstephan should qualify for the wider field of forestry and that graduates should have good practical knowledge, skills and competencies. Practical qualifications were given a high priority by the employers. The assessment of working life was in accordance with the ideas of the faculty aiming at an education with direct practical relevance based on a sound scientific basis.

The result was a curriculum structure with strong practical elements including the project "Forest Management" during the second year, a full internship semester during the third year and interdisciplinary practical courses throughout all terms (Figure 2). Practical training is also an important component of teaching within the "standard" modules. In the next paragraph these elements of practical orientation are described in detail.

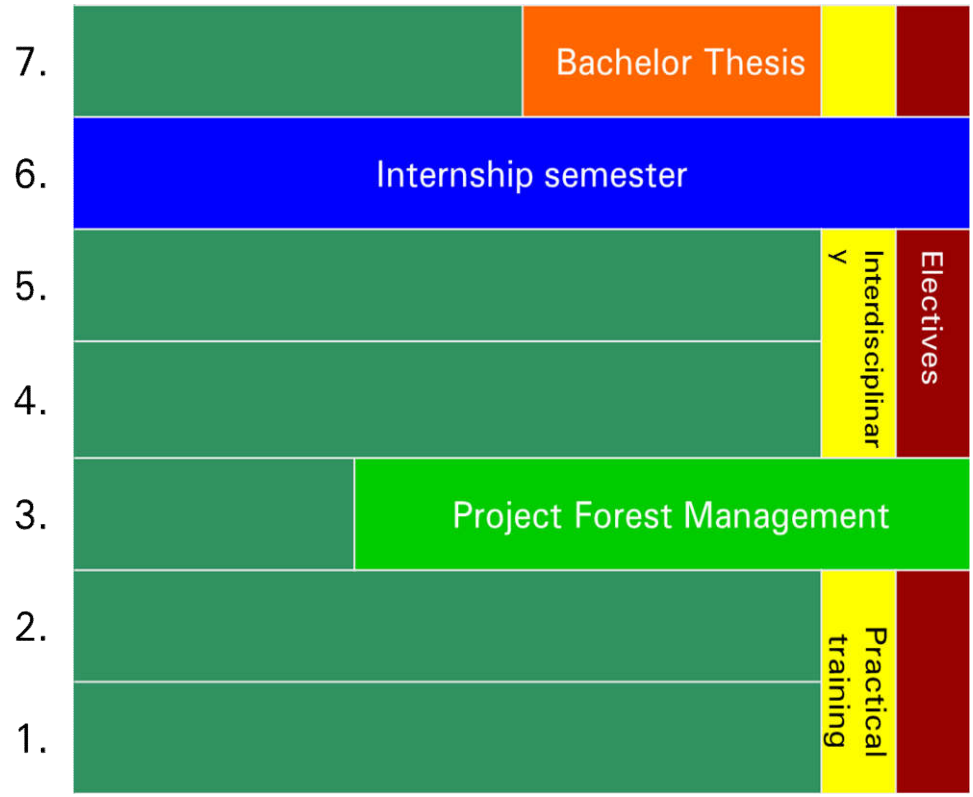

Figure 2: Structure of the Bachelor "Forest Engineering" at the HSWT. Green: "standard" modules (total 25) covering ecological, technical, economic and social subjects. The numbers to the left denominate half year terms (semesters).

Elements of Practical Orientation

Project: "Forest management" (3rd semester)
"Forest management" is a module with 15 ECTS credits (450 hours of student workload) focusing on practical skills with emphasis on harvesting and other aspects of forestry work. It includes three EC (90 hours of student workload) of academic training on harvesting, forest work and log classification and one and a half EC (45 hours of student workload) of chain saw training (including work safety) which is operated in cooperation with a Forestry Training Centre. The main part of this module is an eight week internship in a forest enterprise performing harvesting. The idea is to give the students an in-depth insight into forestry work. The whole module is finalised by an exam consisting of two parts: An oral exam and a student project on a specific aspect of forestry work during the internship. Examples are felling techniques, log classification, planting, skidding, work safety and preparation for mechanical felling.

Three out of four students serve this internship in state forest companies, a smaller fraction in private forest enterprises or contractors (Figure 3).

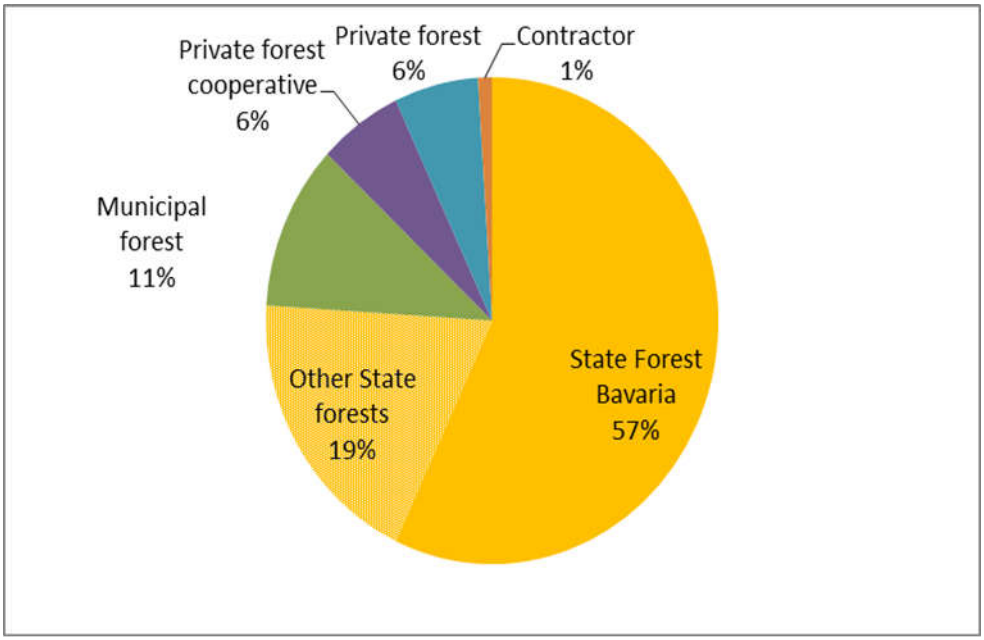

Figure 3: Host institutions for the internship within the project "Forest Management" in 2013. Number of students 113.

Internship (6th semester)

The 6th semester consists of a 20 week internship in an enterprise or organisation operating in the wider field of forestry or forest related activities like nature conservation. Accordingly there is a greater variety of host institutions compared to the project "Forest management" and about 15% of the students perform this internship in an international context (Figure 4). Contrary to the third semester with a focus on forest work aspects, the 6th semester internship aims at giving the students an insight into their future professional tasks. The 20 week internship is accompanied by two weeks of applied academic training organised by professors of the faculty, often in cooperation with enterprises or organisations. The students can choose out of a wide list of subjects ranging from conservation or forest pedagogics to harvesting, economics or information management.

Interdisciplinary practical training

Interdisciplinary practical training has been a "trademark" of forestry education at the Fachhochschule Weihenstephan since its beginnings and has been adopted also in the new Bachelor programme. The interdisciplinary practical training is performed mainly during excursions, where students work in small groups (about 20 participants) on certain tasks. Here the students learn to solve problems taking into account different aspects. A common example would be to prepare a management plan for a certain forest stand considering ecological, economic and work safety aspects. The training is usually coached by two to four professors teaching different subjects in order to guarantee an interdisciplinary character.

Often local experts are involved in order to include practical aspects. Within the Bachelor programme, 25 days of interdisciplinary practical training are compulsory and further options are available within electives.

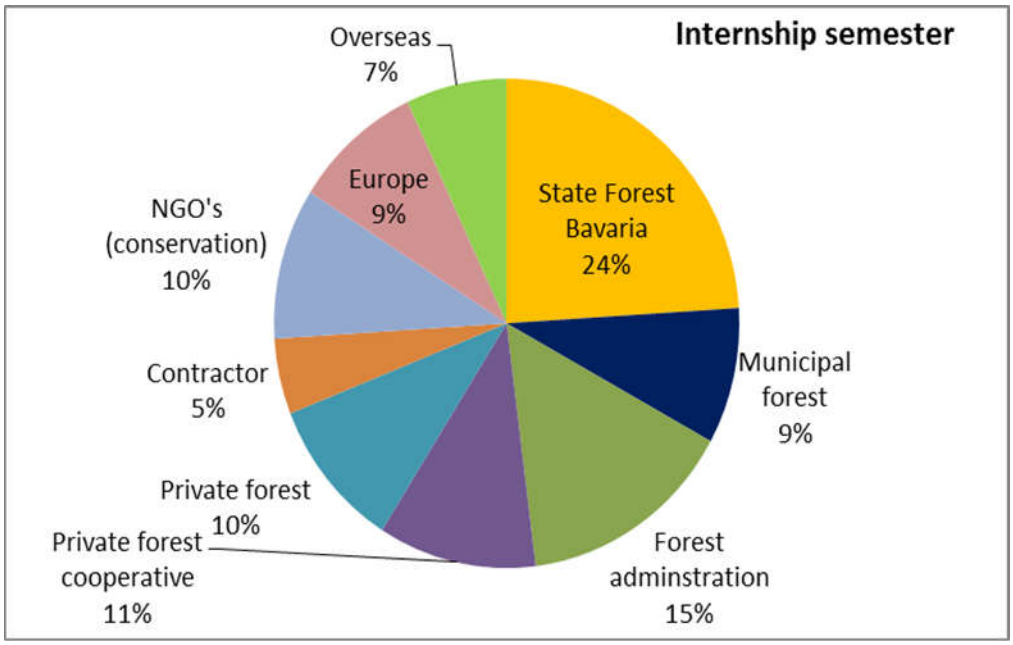

Figure 4: Host Institutions for the Internship Semester in 2013. Number of students 95.

Practical teaching within standard modules

A standard module would comprise five ECTS credits (150 hours of total workload). Its core elements are lectures. However, about 40% of student workload takes place in the form of projects, practical work, seminars or case studies with a strong practical orientation. Normally the whole class of about 100 students is split up in groups of about 20 students, who solve assigned tasks supervised by a professor. Examples would be soil or vegetation mapping, mensuration of forest stands, management planning, log classification, statistical analysis and presentations. An important part of this teaching takes place in the teaching forest (see below).

Teaching forest

Since 2011 the faculty has a 1500 ha teaching forest starting at a distance of 500 m from the faculty. The teaching forest is managed by the Bavarian State Forest Company. A cooperation treaty with the faculty guarantees that teaching and research are given a high priority. The local ranger from the Bavarian State Forest Company is teaching part time at the faculty. A forest professional from the faculty is involved in practical management .

Due to the close personal involvement, teaching is integrated with forest activities. Within the new Bachelor programme every student has to pass a “Teaching forestry

course" and solve different practical tasks like classification of a forest site, identification of plants or animals, log classification, stand classification or preparation of management programmes.

Professional background of teaching staff
Practical qualifications of teaching staff are an indispensable prerequisite in order to teach with practical orientation convincingly. Therefore, Universities of Applied Sciences in Germany currently require at least five years of work experience (with three years outside academia) for application as a professor.
The professional background outside academia of professors at the Universities of Applied Sciences is a major difference compared to "classical" universities, where academic performance is the main requirement for professors. About 20% of teaching within the Bachelor "Forest Engineering" is performed by so-called "Lehrbeauftragte". These are experts teaching a certain subject (often only one course) on a contract basis. Since they are usually employed by another employer, these experts have a solid practical background.

Conclusions

Practical orientation is a key characteristic of the Bachelor programme "Forest Engineering" at the University of Applied Sciences in Weihenstephan. Key elements to implement such a practical academic study programme are compulsory internships, practical teaching methods, a teaching forest and a professional practical background of the teachers. The feedback both from students and prospective employers confirms that these aspects are effective and that the programme has a high level of practical impact. Practical orientation is not a feature which is permanently guaranteed by a specific curriculum but rather an enduring development process. Close liaison with stakeholders from the working life is pivotal to the success of this endeavour.

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INTERNATIONAL COOPERATION IN HIGHER EDUCATION FROM THE STUDENTS' PERSPECTIVE

MICHAEL ALDER, FABIAN LEU, MARKUS PFANNKUCH

Abstract
This paper outlines the view of three Swiss students on the subject of international cooperation in higher education. All three graduated as Bachelors of Science in "Forest Science" and Masters of Science in "International Management of Forest Industries". In the first part of the present document, the visited universities of applied science and the different degree programmes are presented in detail. In the second part, the experiences and observations and the findings' therefrom are argued. Finally, the authors try to identify the major difficulties and give recommendations to improve today's situation.

Keywords: Erasmus, forest science, higher education, international cooperation

The School of Agricultural, Forest and Food Sciences (Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften, HAFL)

The HAFL is one of eight departments of the Bern University of Applied Sciences (BFH). HAFL offers BSc programmes in Agricultural Science, Forest Science and Food Science and Management and one MSc programme in Life Sciences. Surrounded by farmland and forests, HAFL is located in Zollikofen near Bern, Switzerland, and offers a spacious campus including experimental fields, greenhouses, a lodging house, sports fields, a pool and other leisure time facilities. Being the sole University of Applied Sciences for agricultural and forest sciences in Switzerland, students origin from all four Swiss language regions and thus, classes are held either in French or German depending on the lecturer. HAFL scientists run research projects in more than 20 countries and cooperate closely with other universities and organisations. Also students from different foreign countries study at the HAFL either in the framework of a student exchange programme or for an entire BSc or MSc programme.

In order to guarantee a close practical relevance, all forestry students have to be professional forest workers by training or have to complete one year of practical field work in a forestry company as precondition for being admitted to the BSc programme. At the beginning of the third out of six terms, forestry students have to specialize in one out of three major subjects, which are “Forest and Society”, “Forest and Timber Industries” or “Mountain Forest and Natural Hazard”.

Master of Science Programme at HAFL

After completing the BSc programme, students have the opportunity to enrol in the HAFL's MSc in Life Sciences where they will meet students from various countries and with a wide range of different scientific backgrounds. Students can choose from four major fields: "Value Chains and Rural Development" focuses on economic aspects while "Sustainable Production Systems" deepens the technical and ecological topics. Related to forestry, MSc students can choose the major field "International Management of Forest Industries", concentrating on aspects of the forest industry, or the major field "Development in Mountain Areas" focusing on mountain and protection forests.

The major field "International Management of Forest Industries" (IMFI) is the result of a cooperation between HAFL and the Weihenstephan-Triesdorf University of Applied Sciences (HSWT) in Freising near Munich, Germany (see Rothe, this volume). This programme is subdivided into three terms. One term has to be completed at the HAFL. During this term, several interdisciplinary modules are accomplished with other HAFL MSc students. Hence, English is the working language here. Another term takes place at the HSWT with IMFI students only and German as working language. However, this might change stepwise into English in the coming years.

While the term at the HAFL focuses on the mechanisms in international forestry and international forest policies, the term at the HSWT focuses on economy and management. Students can choose individually whether they want to start their studies with the term at the HAFL or the one at HSWT.

The third term is reserved for the MSc thesis which has to be elaborated within a company or in cooperation with an institution. The thesis can be written in different languages depending on the supervisor and the institution but is mostly submitted in German or English.

Students' perspective on international cooperation in higher education

The authors emphasize that the following sections only represent the authors' experiences and opinions and thus, might not stand for all students' opinions.

Erasmus – some personal experiences
With some exceptions, most students completed a BSc programme in forestry in Germany or Switzerland before enrolling in the IMFI programme. Nevertheless, the level of knowledge was astonishingly different and revealed a need for harmonization in European forestry education in both, content and quality. The different education systems do also result from different pedagogical, learning and evaluation methods. While Swiss students are used to self-study and rather informal communication with lecturers, German students are used to rather teacher-centred

teaching and hierarchical structures. Moreover, Swiss students struggled with the German evaluation system that consists of only one exam at the end of the year. On the other hand, German students had problems to adapt to the Swiss system evaluating students in a number of different exams and oral presentations during a term.

Due to such obstacles, a lot of time was lost settling knowledge differences. However, thanks to lecturers and students who were open for new inputs, solving those differences resulted in a broadening of horizons and an additional benefit for all involved parties. In the authors' IMFI class, several and in most cases tough discussions led to improved results and also contributed to changes in the programme's structure what will benefit later IMFI classes.

Beside the Erasmus term, some students had the opportunity to participate in various international conferences and meetings, either in the framework of fieldtrips or as representatives of the "International Forestry Students' Association" (IFSA).

Importance of international cooperation in higher education

Even if forest related environmental issues do have international importance, they are often seen as national topics and, thus, foresters and their education often focus on their own country. As a result, forest experts are mostly underrepresented in international institutions, NGOs and companies. This is why the authors like to emphasize the importance of international cooperation in forest and forest science education. On the one hand, because the experiences described above allow students to train themselves in handling cultural differences. On the other hand, they give them the opportunity to establish contacts and build a personal and international network in an early stage of their professional career.

Major difficulties
From the authors' perspective, international cooperation in higher forestry education is indispensable, not only between institutions, but also between students. However, it presupposes extra efforts on an organizational and educational level as well as a will for change of all involved parties. It also requires much perseverance as initial enthusiasm often faces the various constraints described above. Unfortunately, most universities do not focus on international cooperation and additionally, the international network amongst lecturers seems to be astonishingly poor.

Recommendations
After completing the IMFI programme, the authors recommend that a course in International Forestry should be integrated in every BSc programme to broaden the students' horizon. Regarding international MSc programmes, the authors place emphasis on the use of English as compulsory working language. When elaborating international programmes lecturers should inform each other frankly and fairly

about their BSc programmes' content and thus avoid unrealistic expectations of students' knowledge. Additionally, universities should force a profound evaluation and sound improvement of their newly established programmes. Moreover, students should be prepared to firmly cope with potential difficulties to avoid evitable initial problems and excessive expectations.

Based on their personal experience during the IMFI programme, the authors encourage universities to give preference to lecturers with a broad international network and to encourage their student associations to join the International Forestry Students' Association.

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A MIXED STRATEGY OF PRACTICAL AND THEORETICAL APPROACHES AT HAFL IN SILVICULTURAL TEACHING AND LEARNING[2]

CHRISTIAN ROSSET

Abstract
Close-to-nature and multiple-purpose silviculture is a challenging and demanding task. It requires not only good knowledge about forest ecosystems and the possibilities to influence their dynamics, but also practical skills to apply this knowledge. Decisions to influence forest development must account for the specificities of a given situation and its context. A major challenge in teaching silviculture is to derive a well-balanced mix of theoretical and practical approaches. This paper presents how this challenge is tackled at the School of Agricultural, Forest and Food Sciences (HAFL) of the Bern University of Applied Sciences (BFH) in Switzerland.

Keywords: Close-to-nature silviculture, multiple-purpose silviculture, teaching and learning in silviculture, theoretical and practical teaching, learning approach

Introduction

Silviculture is a challenging and demanding task considering the necessity to be able to take clear, well-grounded and convincing decisions in complex and uncertain environments in order to influence forest development. An important prerequisite is also to steadily learn from decisions made, actions taken and their impact on forest ecosystems and on the multiple values they incarnate for the society and forest owners in order to build expertise.

Furthermore, close-to-nature and multiple-purpose silviculture require a profound knowledge about forest ecosystems and about the possibilities and limitations to influence their dynamic in a gentle way according to the multiple needs of the society and the expectations of forest owners (timber production, biodiversity, recreation and others). It also requires the capacity to adapt interventions to the local specificities of a given situation and to its context in a pragmatic and liberal way (see Schütz, 1999).

In Switzerland, clear-cut is forbidden by law according to Art. 22 of the Federal Act on Forest of 4 October 1991 (=Forest Act, ForA; RS 921.0) and close-to-nature silviculture is compulsory (Art. 20 ForA). As a result, stand mosaics tend to be

[2] Is published also in German on 31st of December 2015 as issue 2015/2 of http://www.forstverein.ch/arbeitsgruppen/waldplanung-und-management/infoblatt.html.

heterogeneous and fine-grained with its smallest units less than one ha in size. Considering this and the heterogeneous topography and geology, forest managers are often confronted with a large variety of situations. Taking into account the federal system prevailing in the Swiss Confederation and the subsequent diversity of silvicultural practices, students should be prepared to be flexible and adapt easily in new situations.

Theory is essential to have a solid foundation to apprehend the complexity of silvicultural management and to recognize relevant existing knowledge likely to be applied in a given situation. Know-how is crucial to apply this theoretical knowledge properly and combine it with findings based on local observations and make decisions in a rational way. The challenge in teaching silviculture is to derive a well-balanced mix of both aspects taking into account the limited time budget at disposal for teaching and learning.

This paper presents the teaching and learning concept for silviculture at the Bachelor level applied at the School of Agricultural, Forest and Food Sciences (HAFL) of the Bern University of Applied Sciences (BFH) in Switzerland.

Conditions of silvicultural teaching and learning at HAFL

Silvicultural teaching and learning takes place in three modules (see Table 1) accounting for at least 4.5 ECTS credits (=135 studying hours) and 11 ECTS credits altogether (= 330 studying hours). Students further have the possibility to deepen their knowledge by writing student assignments in silviculture (two work term papers accounting each for 3 credits and one bachelor thesis accounting for 12 ECTS credits). Silviculture in mountainous conditions is not presented in this paper. It is taught by another lecturer.

Table 1. Overview of teaching and learning modules about silviculture.

Title of the teaching and learning module	Code	Credits dedicated to silviculture (credits of the module)	Semester	Compulsory for …
Basics about site conditions and silviculture	BLFf126	4.5 (6)	4	All students in forest sciences
Sustainable development at the local, national and international level (focus: elaboration of a management forest plan, including a silvicultural management plan)	BLFf155	2.5 (6)	5	All students of the major “forest and society” as well as of the major “forest and timber industry”
Specialisation in silviculture	BLFw046	6.0 (6)	6	All students of the major “forest and society”

Before starting the first module about silviculture, all students are already skilled in forest inventory (e.g. tree measurements, stand maps, sample plots inventories) and forest growth (e.g. knowledge and use of growth models such as yield tables and IT-based simulation models). Furthermore, they have a basic understanding of the forest planning system prevailing in Switzerland, its main types of plans (silvicultural management plan, forest management plan and forest development plan), as well as methods to solve complex problems in a rational way ("Systems Engineering", see Daenzer and Huber, 2002).

The conditions at HAFL are advantageous to combine both practical and theoretical approaches:

- The basic organization of a teaching and learning module comprises contact hours (lectures from the teacher), guided self-study (based on tasks to be performed by the students and feedback given by the teacher), and independent self-study. Basically, for each contact hour, one to two hours of guided self-study and/or self-study is scheduled, leaving enough time for each student to consolidate and expand their knowledge, as well as to practice.
- The classes are relatively small, comprising about 15 to 30 students.
- There are various large forest areas near the campus which are easily accessible within a few minutes. HAFL doesn't own any forest, but cooperates with the main owner of the forest areas.

Teaching and learning concept of the module about basics in silviculture

The teaching and learning concept in silviculture is illustrated on the basis of the first module (BLFf126, see Table 1). At the end of this module, students should be able to elaborate a clear, well-founded and convincing silvicultural project for a given forest area likely to be submitted successfully to the forest owner and/or the forest service. The content of the silvicultural project basically encompasses the analysis of the forest area and the overall silvicultural targets, a silvicultural intervention concept and its subsequent stand intervention priority map, as well as its implementation by means of tree marking in the stands at the highest priority level. Students should be able to apply basic principles and techniques of Systems Engineering to structure and organize the project in a rational and coherent way, such as problem resolution cycle and system thinking, proceeding from the whole to its composite parts, and thinking in variations, which means not to focus on the first solution but be creative and elaborate different possible solutions in an attempt to find the best adequate one (see Daenzer and Huber, 2002).

The examination of the module takes place in the forest at a location which has not been visited previously during the course. Students are asked to elaborate a silvicultural project for a forest area of 4-5 ha focusing on a main topic, which could be tending and thinning, regeneration cuts, plenter forest or stand conversion from even-aged to uneven-aged. Just before the examination starts, they receive a map with the delineation of the forest area and the examination topic. Each student

works in a different area and starts at different times according to a predefined schedule. They have two hours and 15 minutes to prepare the silvicultural project and 20 minutes to present it to the module teacher and, in most cases, the local forester (forest engineer or forest guard), but not to their colleague-students. The examiners have 3-5 minutes at their disposal to ask questions. At the end, students have 3-5 minutes to evaluate their performance on their own, estimate their grade and present their self-evaluation. The teacher gives a feedback before closing the examination, so that the students know about where they have performed well and where there is need for improvement.

Students receive the evaluation grid of the examination at the beginning of the module. It is organized in rows corresponding to the main components of a silvicultural project (see above) and their respective expected content, as well as in columns qualifying the way the content has been elaborated, organized, structured and presented; especially, it has to be clear (well-structured, focused on the essential, comprehensible), correct (use of technical terms, application of theory), convincing (main problems, challenges and opportunities acknowledged, realistic, practical and well-founded decisions) and ensure a certain level of performance (level of knowledge, creativity, self-reflecting).

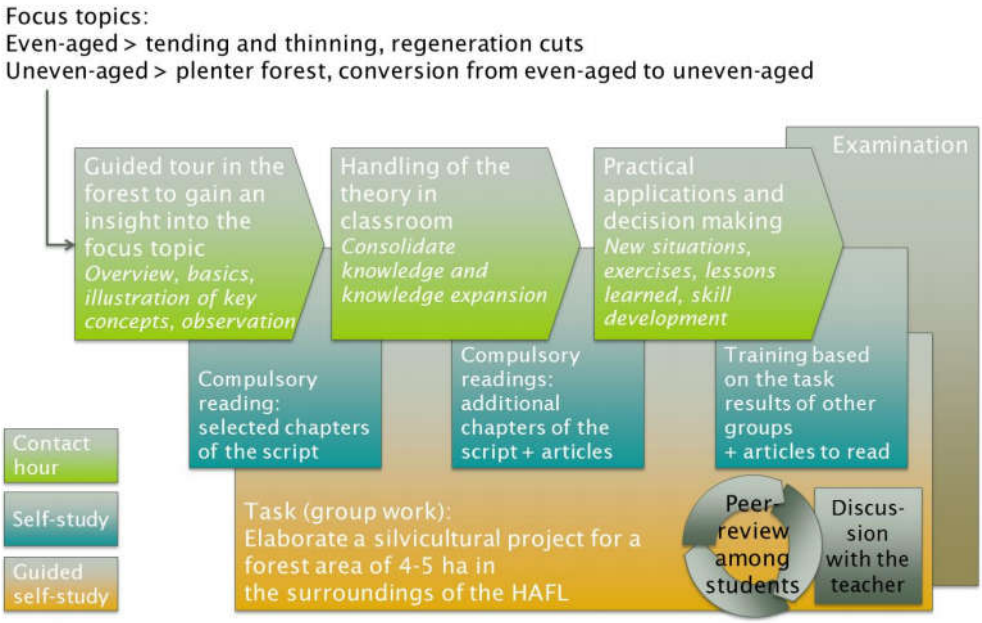

Figure 1. Mixed theoretical and practical approaches in the teaching and learning module "Basics in site conditions and silviculture".

The content and structure of the module is organized according to the four focus topics, which can be evaluated during the examination (see Figure 1). The first lecture provides students with an overview of the main silvicultural systems, key concepts and the main actors, as well as with a short historical background and

current challenges. From the beginning, students are informed about the regulations of the examination. They are regularly prepared and trained for the examination throughout the whole module, repeating the elaboration of a silvicultural project for each of the main focus topics (see the task in the guided self-study in Figure 1).

Different didactic methods are used in the module to facilitate the assimilation of the theory, like the puzzle method in order to summarize the knowledge about single tree species available in the teaching scripts (see Schütz, 2002a; 2002b; 2003 for the online available scripts or Schütz 1990 and Schütz 1997 for published books). All mentions about tree species are highlighted in these scripts with a specific colour for each species to facilitate the search process (the highlighting was automatically done by program code running in Word).

Figure 2 provides an example of one of the techniques applied in silvicultural projects to promote observations and to elaborate a solid basis for decision making. This example is about regeneration cuts in even-aged stands. Its purpose is to systematically map the occurrence of tree regeneration (with information on tree species and tree height) and problematic situations for the following regeneration, to map visible trunks to backtrack past interventions, and to map the canopy cover to better understand light dosage under the canopy. Put altogether, these maps help to better understand in which conditions the regeneration of specific tree species is likely to appear and further develop or not, as well as to reflect on what they have learned from theory. Coupled with additional mapping, (e.g. about production capacity and production potential of the trees of the main strata) they represent the basis for decision making concerning the design and the coordination of regeneration cuts in space and time.

The map in Figure 2a represents the occurring tree regeneration (see the green colour and different shades corresponding to the dominant tree height) with information about the tree species composition. It also shows areas where regeneration is expected to be problematic. The map in Figure 2b visualizes trunks with indications on how old they are, as well as gaps in the main tree strata. The map on Figure 2c illustrates the canopy cover of the main strata (in black) and the intermediate strata (in green) with strips oriented according to the degree of the canopy cover.

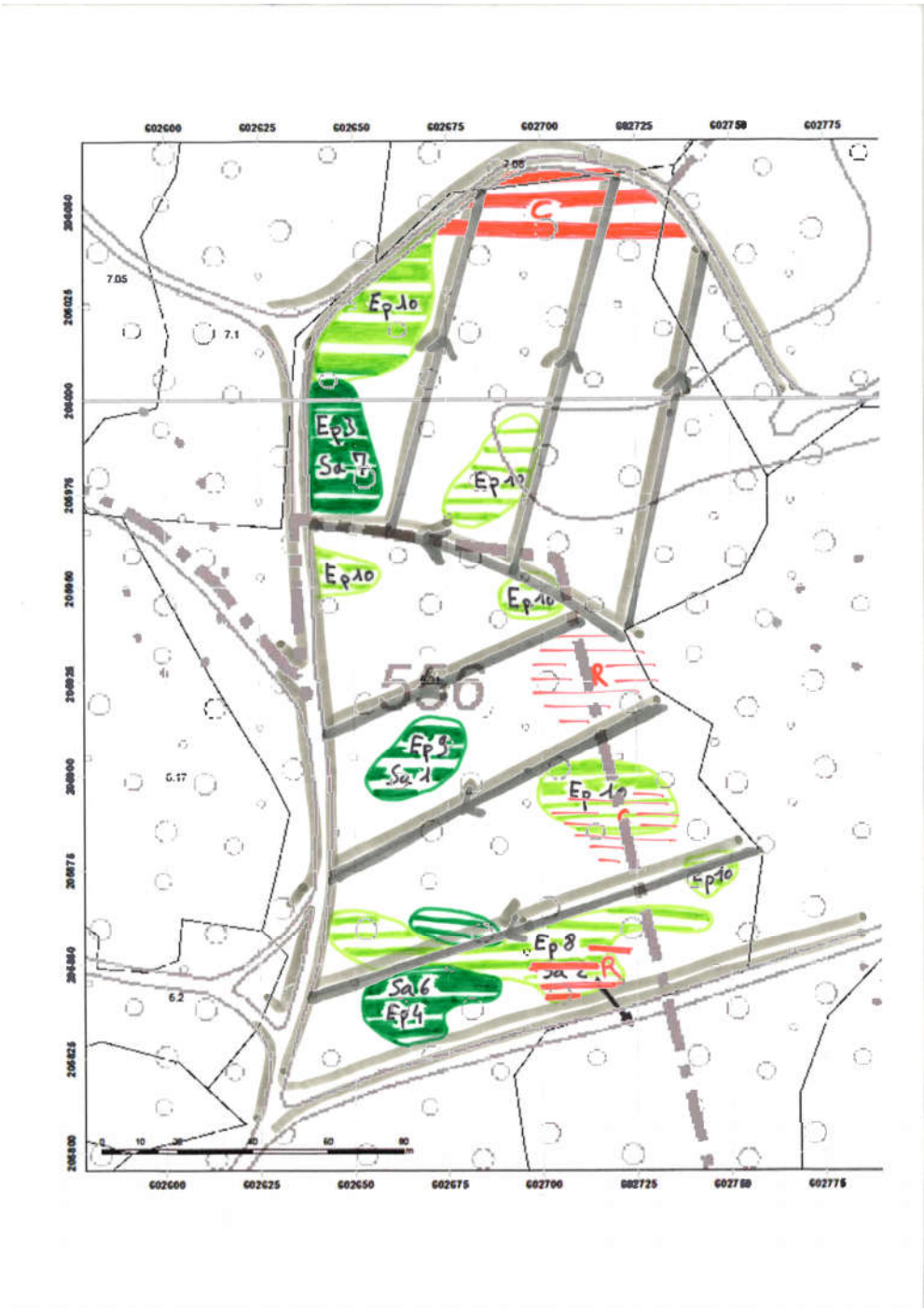

Figure 2a: Cartography exercise on tree regeneration: here the occurring tree regeneration. See text. Drawing: Eric Wuillemin, HAFL).

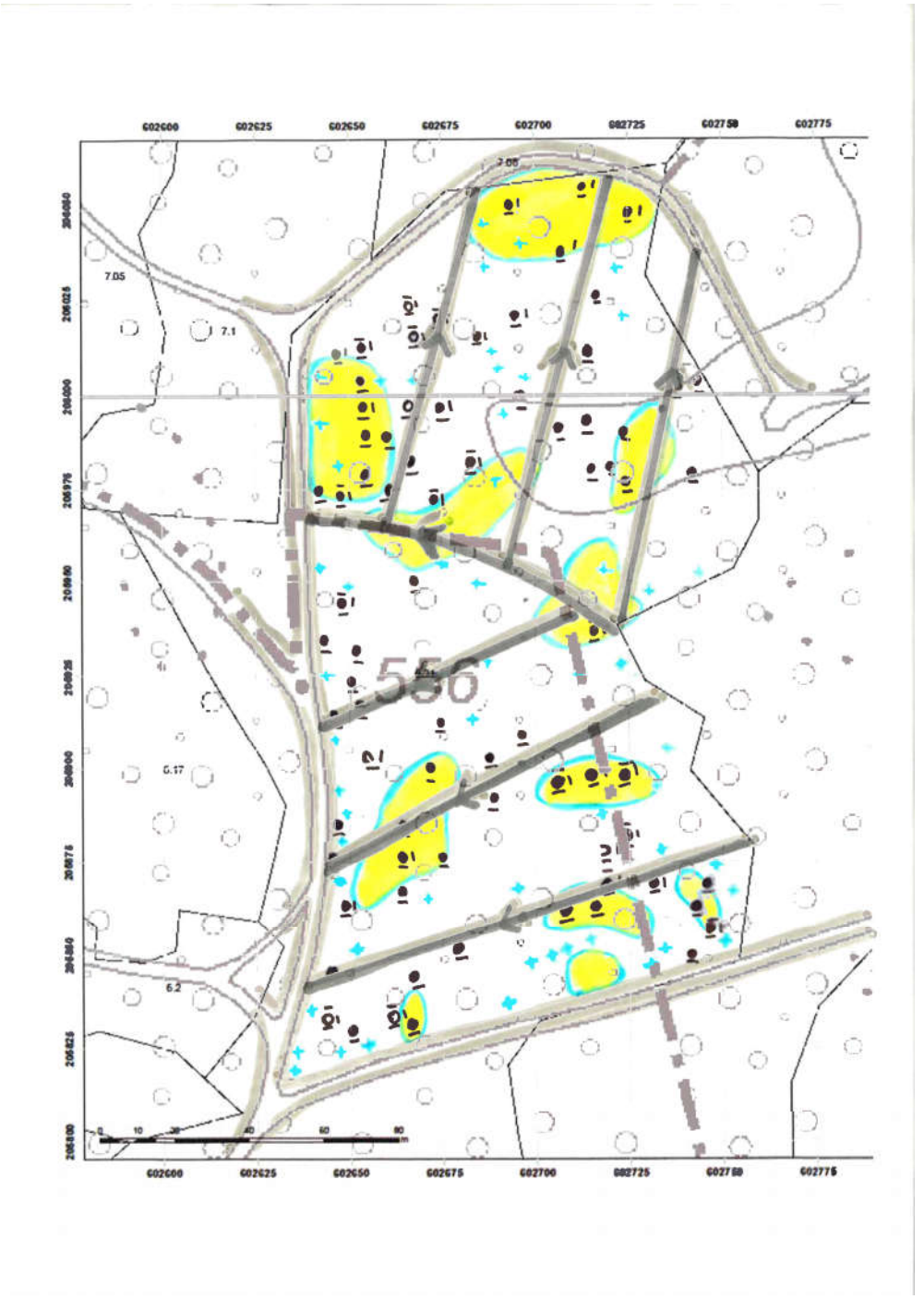

Figure 2b: Cartography exercise on tree regeneration: here trunks. See text. Drawing: Eric Wuillemin, HAFL.

Figure 2c: Cartography exercise on tree regeneration : here canopy and canopy cover. See text. Drawing Eric Wuillemin, HAFL.

Synergies with research and development activities at HAFL

Currently, the team for silviculture and forest planning at HAFL is composed of six people. It is not only focused on teaching and learning, but also to a larger extent in research and development. A set of IT tools targeting practitioners was developed over the past years to support sustainable forest management. IT is a very useful medium which makes research easily accessible, applicable, as well as enjoyable. For example, the following tools are used in teaching to facilitate learning:

MOTI (MObile TImber cruise) is a Smartphone app taking advantage of sensor technology to facilitate data collection and data analysis in the forest. With a few clicks students can quantify what they see, such as basal area, stem density, growing stock and dominant tree height (www.moti.ch), in essence all key information for silvicultural decision making (see Rosset et al., 2015a; 2015b and Ficko et al., 2015).

SiWaWa is a growth simulation model based on the input of MOTI. It is available as a windows application (www.siwawa.org). It is also integrated in MOTI as an extension. It serves to quantify stand growth and simulate stand development over several decades. It helps students to better visualize the growth dynamic of stands they are currently in. For example tree height increment is estimated to better assess the current and future competitive situation among trees. They can also assess the consequences of different thinning variations in a given stand (see Rosset and Schütz, 2015).

Sylvotheque.ch is an internet platform for the 360° visual documentation of the forest. It aims at reflecting the diversity of forest conditions and silvicultural practices as well as at better tracking changes over time by comparing different states. It is used in the classroom to illustrate theory and explain silvicultural practices or to train observation capacity (www.sylvotheque.ch).

Discussion and conclusion

Two years ago, the described teaching and learning concept has been implemented and it has proven to be an appropriate method with regards to reaching the teaching and learning module targets. The feedback from practitioners involved in the examinations was positive, even enthusiastic. In 2015, the students evaluated the module (13 out of 20 registered students took part in the evaluation) and also gave positive feedback. All students mentioned that they learned a great deal (13/13) and either had a very good (7/13) or a good (5/13) impression of the course. Furthermore, the level of difficulty was just right (11/13) and most students strongly agreed that the lecturer used appropriate methods to enhance the learning process (9/13). Nevertheless, considering learning effects and time invested by the students, there is still room for optimizing the guided self-study tasks.

Generally, the positive feedback is very encouraging and it has been proven that this type of a teaching and learning concept performs well in relatively small classes. In 2015, however, about 40 students started to study forest sciences at the HAFL. Consequently, the challenge will be to adapt the current concept to the larger number of students attending the first silviculture module in 2016.

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COMPACT COURSES IN HIGHER EDUCATION[3]

SIEGFRIED LEWARK

Abstract
Achieving competences needed by professionals in their working lives may be supported by compact study courses within and outside formal study programmes of higher education. These courses may be organised in different manners, either as block courses at home universities, or as summer schools located elsewhere, in forestry education, often closely to the objects of learning. They may be limited to enrolled students or open to an international participation, implemented for the benefits of increasing competences or as a source of income for organising institutions. As in the case of any other teaching unit, the learning success in higher education will greatly depend on the applied didactical principles. The learning paradigm, in contrast to the instruction paradigm, uses a course organisation that relies on an active and self-responsible learner and focuses on the learning process. The learner, therefore, must have space and be motivated to self-organised learning. How to accomplish this in compact courses? To the greatest possible extent, learning would be conducted through working on particular cases, with experts as reference persons at hand. The role of the teacher is primarily to support and moderate the learning process. The assessment of results and outcome of learning should match the learning objectives. Examples are given and discussed.

It is shown that compact courses allow didactic approaches following the learning paradigm in an easy, natural and methodically inherent way. Principles of learning by applying research methods and of learning by doing, i.e. by working on practical tasks, are typical for compact courses. It is strongly recommended to continue to offer compact courses and to develop new ones.

Key words: higher education, forest sciences, compact course, summer school.

What is a compact course?

Study programmes in forest sciences, like any other study programmes, are organised in different ways and consist of courses of different formats. They very much differ with respect to the degree, at which the students have a freedom to choose between courses offered.

Traditionally there was a dominant role of lectures or readings, complemented with lab courses, field exercises and excursions. But in addition to courses held regularly

[3] The presentation underlying this text has been presented at the SILVA Network conference 2014 in Bern, and before at the conference „The Role of Forest Utilization and Ergonomics in Modern Forestry" at the University of Agriculture in Krakow, June 2014 (Lewark, 2014).

for some hours per week throughout the semester, according to a regular week schedule, there have always been compact courses: summer courses (non-term courses), excursions of some days, and also blocked courses during the semesters (continuous full time courses over a period of time, not rotating with other courses as in a traditional regular week schedule).

These compact courses have been organised in different ways, either as block courses at home universities, or as summer schools elsewhere, outside the home universities, in forestry education often closely to the objects of learning. They were limited to enrolled students or open to an international participation, implemented for the benefit of increasing competences of the students or as a source of income for organising institutions.

The ideas behind such compact courses are different, which may be seen from the names: intensive course, crash course, short course, advanced course, specialisation course , lab course, field course, excursion, international summer school. The courses have in common that they are held in one fixed period of time, without interruption or interference by other courses.

The most extensive use of compact courses is in study programmes completely organised with block courses, as for example the diploma programme of forest sciences at the university of Freiburg from 1995[4]. There were courses of one week, two weeks and three weeks of length.

Certainly it must be worthwhile to look at the didactical ideas behind the compact courses, as we may assume there are not only structural considerations. There are a few publications presenting didactical concepts for study programmes in forestry and related fields (Riemenschneider, 1975; Lewark, 1998; Lewark, 2002 a, b).

The idea of this text is to draw attention to the characteristics of the learning and teaching processes of compact courses and to the didactical concepts, and to demonstrate this with examples – there would be many which deserve attention, but the examples selected all belong to the disciplines of forest utilisation, forest road construction and forest work science, including gender aspects, because of the occasion for which the presentation originally was made: the celebration of 50 years of the Department of Forest and Wood Utilization at the University of Agriculture in Krakow (cf. footnote 1).

[4] This study programme has been replaced by several Bachelor and Master programmes when implementing the Bologna process; it has been described several times (see e.g. Lewark, 1998; Lewark, 2002 a, b) and evaluated (Mutz, 2001; Webler et al., 2000), but a retrospective appraisal afterwards has never been done. The new Master programmes adopted a block teaching structure again.

Didactical concepts for compact courses

As in the case of any other teaching unit, the learning success in higher education will greatly depend on the applied didactical principles. The learning paradigm, in contrast to the instruction paradigm, uses a course organisation, that relies on an active and self-responsible learner and focuses on the learning process. The learner, therefore, must be challenged and be motivated to active and self-responsible learning (Photo 1).

Photo 1: Active students presenting results from assignments (from example 3, Vienna 2011).

How to accomplish this in a compact course? It can be approached by working on case studies, with experts as reference persons in the background. The role of the teacher then is primarily to support and moderate the studying process. Of course the assessment of results and outcome of learning should match the learning objectives.

Compact courses are always developed in a special organisational framework and create specific learning and teaching situations (Figure 1), like the curriculum revision at the Faculty of Forestry of the university of Freiburg in 1995. “The basic idea behind the introduction of the block teaching system is the deepening of the contact of the students with the object of their study, forest and forestry, and the improvement of the social and personal qualifications by suitable forms of learning. At the same time, a block teaching system is an ideal starting platform for courses of continuing education.” (Lewark, 1998).

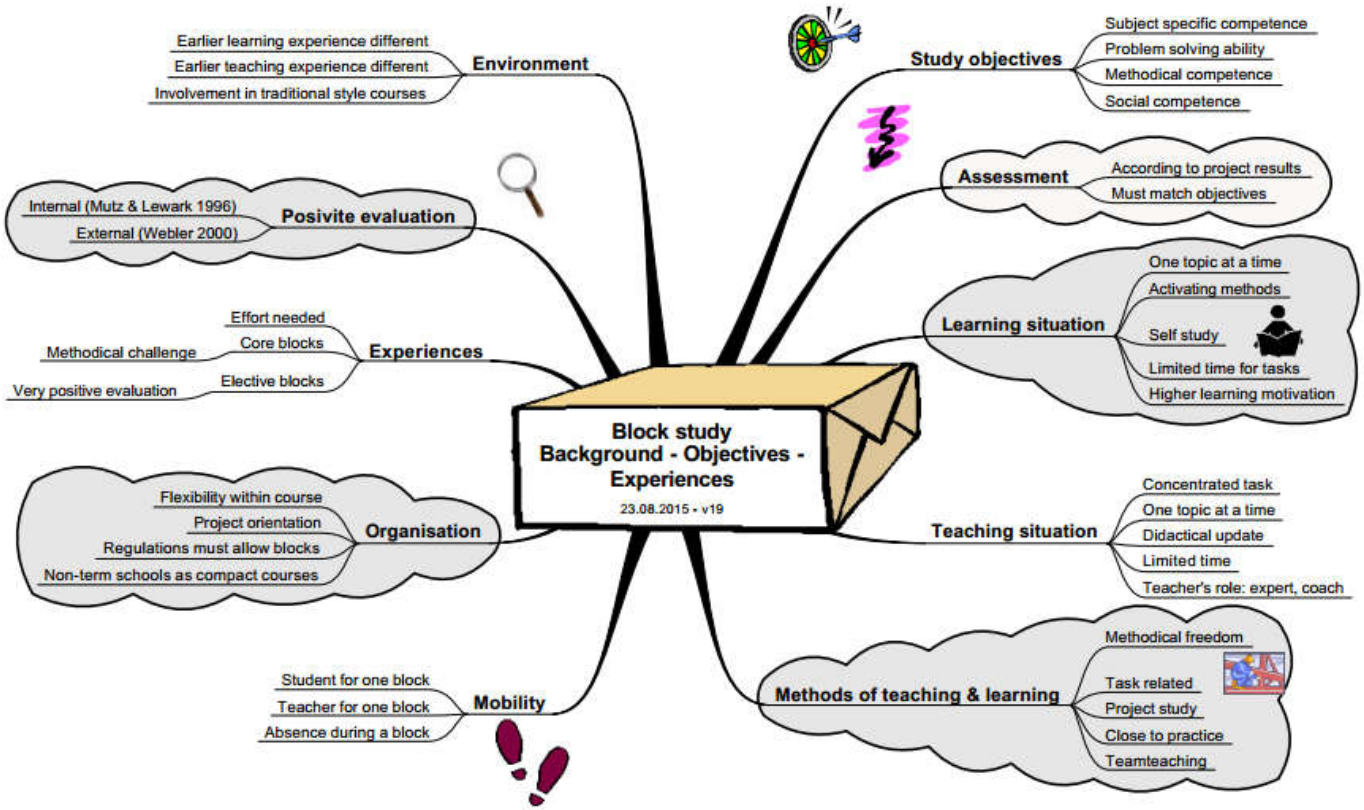

Figure 1: Aspects of compact courses in a mind map, used for discussions in a process of curriculum revisions at the Faculty of Forestry and Environmental Sciences of the university of Freiburg (2013, modified).

Compact courses give the teacher more methodical freedom (to use e.g. methods like short lectures, phases of literature search and reading, data assessment, data evaluation, presentation of results, discussion) and more flexibility of the schedule than courses fragmented into one-hour or two-hour units or even a morning or afternoon per week. Team teaching can be done easier. Case studies with practical relevance or projects from the practice can be better organised. This means a more concentrated approach – no distraction by other tasks, but also more input in a limited time frame.

Other courses or tasks will not interfere, not for teachers[5] nor for learners. The learner can be more easily activated, given jobs to fulfil, coached by a teacher in reach. Flexibility of schedule within the course also allows flexible timing of self study. Assessment of performance can be done based on project results (which of course is true for project study in other organisational settings as well).

The concentration on a compact time, e.g. a week or two weeks, allows an increased mobility: an external teacher with specific expertise may participate – a student may go somewhere for a different course – a student may be absent from his home university in order to do anything else, anywhere else.

Three examples of compact courses

Example 1: Forest road construction
The course "forest road construction" represents a type of non-term courses which for example has been introduced into the forest sciences curricula of the universities of Göttingen and Freiburg (Becker, 1986; von Fürstenberg, 1998). In this course a task from practical forestry is performed (Photo 2): the planning of a forest road to be constructed later based on the project results from the course. Forest roads built after earlier courses have been visited during the course, in order to demonstrate the practical relevance of the task and to help students to imagine the path from their project work to future realisation.

This task requires a systematic approach, from the knowledge needed, over the field work to collect the data needed, the planning phase with plotting paper and computer, to the completed plan, to be presented to the forester and forest owner out in the forest.

[5] This is an idealised description, as in reality teachers, when at their home universities, may have several different tasks at the same time, outside of the course.

Photo 2: Student at work: data assessment for forest road planning (photo: D. Jaeger).

The course has been held in Freiburg every year from the 1970s till today, in most cases twice per year, as number of participants per course had to be limited and the interest in participation was very high. Details are given in Table 1. The course was always held in German.

What competence do the students gain during this course? At the end the students have learned, from their project work, how to plan, execute and evaluate a forest road, and in addition gained transferable skills like organising a project in a working group, organise project work and experience with the presentation of project results with a critical and supporting audience. As a rule they enjoyed the change between classroom and field work, even under unfavourable weather conditions.

Table 1: Details of the elective course "forest road construction" at the university of Freiburg.

Course title	Forest road construction Walderschließung und Projektplanung
University	Freiburg
Study programme	Diplom-Forstwirt (since 1976), BSc forestry (2005)
Status	Elective (partly obligatory: certain number of credits from list of electives needed)
Participants	Freiburg students of forestry (open for practitioners)
When held	Since 1976 (1-2 times per year), outside semester
Course length	Two weeks
ECTS credits	4 (four)
Course objectives	Knowledge, abilities
Contents	Project planning in classroom and terrain
Didactical approach	Introduction, data assessment & project design (real project); complementing lectures
Outcome	Ability for planning, executing and evaluation of road construction project, transferable skills
Assessment	Group work results, self study result: part of construction plan, extra tasks with extra credits in study programme of 1995

Example 2: Work study
"Work study I"[6] was a course developed for the study programme of 1995 at the university of Freiburg. It was a one-week course in the elective[7] part of the study programme and has been held more than twenty times.

This course was a basic course of forest work science, following three days on forest work science in an obligatory course ("core block"). It was held in German.

The course objectives were: a basic knowledge of methods of studying forest work (time study, stress and strain study, the ability to plan and execute such studies). In most cases this course was done using pruning of forest trees (see Photo 3) as an example, sometimes planting of forest trees, because not all students in the courses had the necessary qualification for executing dangerous forest work like felling trees. Furthermore for such a study short work cycles are useful, as a minimum number of cycles has to be done and evaluated to make the study meaningful.

Aspects like group work and project work are obviously similar to those from example 1 (cf. Table 2). At the same time an affective orientation was an important study objective: The personal experience of the hardship of forest work was meant to give some feeling for the work done by forest workers, as graduates, who will go into practical forestry, may be managers of officers responsible for this work and

[6] Other work study courses dealt e.g. with projects of social science aspects of works, with legislation related to occupation, with exploring the labour market for graduates and with gender aspects of forest work

[7] A specified number of credits had to be collected from elective courses (Wahlpflicht) in each of four different fields of study (Lewark, 2002a).

thereby for the working conditions and the well-being of the workers. The personal experience gives better opportunities for such an affective orientation, much better than talks, statistics or pictures in a lecture in the classroom.

Photo 3: Student at work: demonstration of tree pruning during field work (students do the work to be studied themselves, provided they have the competence).

(Table 2: Details of elective course “work study I” at the university of Freiburg.

Course title	Work study I (stress and strain) Arbeitsstudium I. (Belastungs- und Beanspruchungsstudium)
University	Freiburg
Study programme	Diplom-Forstwirt (1995), BSc forestry (2005)
Status	Elective (partly obligatory: certain number of credits from list of electives needed)
Participants	Freiburg students of forestry (open for practitioners)
When held	1995-2005 (1-3 times per year), within semester
Course length	One week
ECTS credits	2 (two)
Course objectives	Knowledge, abilities, affective orientation
Contents	Stress and strain in forest work
Didactical approach	Introduction, demonstrations, data assessment & evaluation, self study, additional tasks, no marks
Task	Work & time study: pruning standing trees, data assessment and evaluation
Outcome	Ability for planning, executing and evaluation of work & time study, transferable skills
Assessment	Group work results, self study results, extra tasks with extra credits

Photo 4: Discussion round at course "Gender Competence", Vienna 2011.

Example 3: Gender competence

"Gender competence" is an example for an international non-term school, in this case a spring school. It was organised in the frame of a EU programme for so-called intensive courses, which also provided funding for travel and accommodation[8].

The course was announced as a "learner oriented international spring school" of two weeks (5 ECTS credits) and held 2011 at BOKU, Vienna, and 2012 at Warsaw Life Science University (WULS), with coordination from the university of Freiburg. Students and teachers came from four universities: Freiburg (organiser), BOKU Vienna, SLU, Sweden, and WULS (Lewark and Karmann, 2015).

The courses had international groups of participants and were held in English. It was not project based, but centred around assignments as means of activating students (Photos 1 and 4), to be elaborated before, during and after the course (cf. Table 3). An e-learning platform (Moodle, hosted at BOKU) was used for communication (video-conference, chats, uploading and commenting of assignments and well as providing publications).

Learning objectives in the course description were gender competence, with relation to forestry and natural resources management in general. "Results of students' evaluations included: general satisfaction with the courses; much gender theory wanted; majority of participants were female, but there were also many male students who were interested in gender competence; mastering of English language was already excellent before the course; workload was generally considered adequate; the spring school has been recommended to other students." (Karmann and Lewark, 2014).

[8] EU grant DE-2011-ERA/MOBIP-2-28409-1-43

Table 3: Details of spring school "gender competence", organised at the university of Freiburg

Course title	Developing gender competence in higher education programmes on natural resources management (GenCom2)
University	Freiburg / Vienna / SLU / Warsaw
Study programme	MEG (Freiburg)
Status	Elective for Freiburg students (partly obligatory); to be acknowledged individually in the other universities
Participants	Master students (PhD researchers)
When held	2010, 2011; outside semester
Course length	Two weeks
ECTS credits	5 (five)
Course objectives	Knowledge, gender competence
Contents	Gender theory, gender analysis
Didactical approach	Introduction, expert input, assignments
Assessment	Based on assignments
Funding	Travel and subsistence money for traveling students and teachers through DAAD within EU project

This course has been developed after gender related courses with different subjects held in the frame of the study programme of 1995, similar to that presented as example two, and, after that, blended e-learning courses (Lewark, 2006). The latter ones were started by face-to-face phases (in Evenstad, Norway; Freiburg, Germany; Göttingen, Germany; Joensuu, Finland), but the main part was done using different e-learning platforms. The advantages of blended e-learning courses are summarized by Lewark (2013).

The block courses with gender issues have also been described elsewhere (Karmann and Lewark, 2014; Lewark and Karmann, 2015).

Discussion

The general ideas behind compact or blocked courses (and study programmes) in forest sciences, have been described above. Compact courses create specific learning situation experiences, as demonstrated with the three examples. These examples all come from forestry study programmes at the university of Freiburg, the reason is mentioned above. Another block course from Freiburg has already been presented in a SILVA Network annual conference: the first semester project (Lewark *et al*., 2007). It follows the ideas of "problem based learning" (PBL) in a year cohort of up to hundred students in the very first days of study. The first semester project has been used in modified way after the change from "radically revised" curriculum of 1995 into the Bachelor/Master course system after 2004.

In the frame of SILVA Network annual conferences other compact courses have been described: international summer schools at Freiburg university as "stepping stones to PhD (Koehler and Mühlsiegl, 2008) and two international summer schools at the Technische Universität München (Ziesak *et al.,* 2008). Westermayer (2008) analysed the special challenges arising from the often very heterogeneous students groups with different backgrounds, knowledge and motivation.

What do these examples show? Some of the examples and the block study programme of 1995 have been evaluated, using different methods (Mutz, 2001, Webler *et al*., 2000). The results of the evaluations underlined, among other aspects, the fundamental differences of compact courses with different numbers of participants. Here I only refer to courses with smaller groups (with up to 12-20 participants, often more divided into smaller groups) and will exclude the specific issues of year cohorts.

Are the study objectives as mentioned above being reached, have the expectations behind the creation of the courses been met? The answer generally is positive with respects to the study objectives like subject specific knowledge, problem (task) solving ability and transferable skills, reached by using case studies or assignment based approaches in the courses. At the same time the structural advantages, have certainly been achieved, according to the evaluations, the feedback of the students and my personal experience. Also the promotion of mobility of teachers and students as well as the methodical flexibility have been observed and often stressed.

In particular the compact courses have been appreciated by students and been very rewarding for teachers because:

- they lead to more interaction between students and teachers;
- they are based on more interaction within the groups of students;
- the roles of teachers tend to be that of experts and coaches of the learning process;
- they provide a new experience every time.

A complication should be mentioned here: compact courses are not simply compatible with regular week schedules (Figure 1). That is why so very often they are offered as non-term courses, spring schools, summer schools. To solve this for completely block courses requires a lot of creative thinking and decisions.

What are input and resources needed? Group work always benefits from coaching, which - in the classical “problem based learning” - is done by older students (who learn much by this teaching or coaching role). A new course setting or task always requires a new idea and taking care of new data or contact with practical working life. But then project work and case study work, after the initial input and introduction, develops by itself, by working on the project.

Many of the compact courses, and definitely those presented here as examples, have been developed in the course of revisions of study programmes. Other compact courses have been developed pragmatically in existing study programmes, using the freedom of regulations, just because teachers were convinced of the learning success of practical application (like forest road construction) and wanted to try out new forms of course organisation.

Outlook

The experiences with compact courses, and even more with the introduction of block study programmes, have resulted in more attention for learning and teaching processes and reflection about the impact of didactical considerations on the learning success.

Compact courses often result in a very specific experience, remembered forever: I met former students somewhere outside university, who in their very first sentences recalled a specific excursion (Norway 1999), some years after, either in general or specific situations. This demonstrates that there is an emotional anchor in their memory, which is connected alive in the memory and certainly connected to the learning situations.

Excursions of one or two weeks like the summer excursions ("große Sommerexkursionen") organised for many years at the universities of Göttingen and Freiburg, to which the student's comment is referring, are also compact course worth to be mentioned. They allow visiting forests out of reach for one-day excursions. Didactical considerations for excursions should also include activation of the students, e.g. by several smaller or fewer bigger jobs to do.

Compact courses allow didactic approaches following the learning paradigm in an easy, natural and methodically inherent way. Principles of learning by applying research methods ("forschendes Lernen") and of learning by doing, i.e. by working on practical tasks, are typical for compact courses. They allow the students to achieve the competences they will need in their future work because the cases they work on are often close to reality of working life.

Therefore, let's develop and hold more compact courses. And let's, where necessary, modify the regulations for study programmes in a way, that allows or even stimulates the organisation of compact courses, in its different formats. It will always add new perspectives to learning and teaching.

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TODAY'S TEACHING AND LEARNING WITH NEW MEDIA IN THE FORESTRY EDUCATION AT THE UNIVERSITY OF NATURAL RESOURCES AND LIFE SCIENCES, VIENNA

CLAUS RAINER MICHALEK

Abstract
E-learning at the University of Natural Resources and Life Sciences, Vienna refers to a eighteen-year old history. What started as an ambitious attempt by early adopters has become an integral part of today's teaching and learning (Kertész and Michalek, 2007). The forestry curricula are no exception in this respect: three quarters of the courses of the Bachelor of Science programme "Forestry" use "BOKU learn", a learning management system based on "Moodle". Learning resources like PDF files form the backbone of the courses. Activities complete that offer in many and diverse ways, often reflecting the creativity of the teachers. Discussion forums can be found in nearly 30% of the courses of the bachelor programme "Forestry", the same applies to quizzes in the elective courses. Assignments and choices support the organisation in about 15% of the courses. Over the last five years, lecture recording was established and covers 10% of this programme. Since smartphones are widely used, mobile learning is about to become an addition to classical e-learning.

Keywords: E-learning, blended learning, mobile learning, Moodle, forestry education, Austria

Introduction

Since 1997 e-learning has been used as an addition to face-to-face teaching and learning at the University of Natural Resources and Life Sciences, Vienna (BOKU). Starting as initiatives of individual teachers it soon (winter term 2003/04) led to the introduction of a campus wide learning management system and a central support unit. Ten years later all bachelor programmes utilise "BOKU learn", which is based on the popular open source learning platform "Moodle". The bachelor programme "Forestry" is no exception in this respect, however a closer inspection of the tools applied might be beneficial.

The use of e-learning in the Bachelor of Science programme "Forestry"

The Bachelor of Science programme "Forestry" offered at BOKU is a three-years programme comprising of mainly compulsory courses (162 ECTS) and a few elective ones (18 ECTS). The tuition language is German. The data basis for this

study is the academic year 2013/14 which saw 170 first-year students and 38 graduates.
All programmes currently offered at BOKU are campus-based and therefore following a blended learning approach, which means combining face-to-face teaching with online teaching and learning. The teachers are free to choose the appropriate media to support their didactic concepts.

E-learning in this bachelor programme is used frequently: 48 of 64 of the compulsory courses (75%) and 16 of 21 of the elective ones (76%) use "BOKU learn". Among these compulsory courses 11% use lecture recording and 2% already explore the possibilities of mobile learning. The backbone of most of these e-learning courses form the mostly text-based materials which is a very common practise not only at BOKU. The importance of complete and up-to-date learning resources presented in a clearly structured way was highlighted by the "eSTUDY" project, for example. This project carried out by the work group for Educational Psychology of the University of Graz examined the usage and needs of students concerning e-learning on a national level (Paechter *et al.,* 2007).

The presentation of the content itself is clearly dominated by platform independent PDF documents which can be found in two out of three courses. The next most common content types are HTML pages, links to external pages and pictures. These three types together make up about the same percentage of usage as PDF documents alone.

The old prejudice that e-learning is mainly made up of content is not true, at least not for the BSc programme "Forestry" at BOKU. The learning platform "Moodle" offers a variety of activities and the teachers make use of them as illustrated in Figure 1. In contrast to the content, there is no clear preference for a single type of activity. Discussion forums play a major role in about 30% of the courses. Assignments can be found in two out of five courses. Assessments are even the most commonly used activity but only in the elective courses. However, one tendency is recognisable – namely the increase in the use of activities in elective courses compared to the compulsory ones.

Since most activities modules can be set up differently to serve various didactic settings a more detailed analysis of the two most popular Moodle activities – "Forum" and "Quiz" – completes this picture. Table 1 shows that the one-way-communication of news forums is to some extent replaced by discussions among all participants in the elective courses. However, a separation into groups of students within a course is seldom practiced. The "quiz" activity has two main fields of application: firstly, as a tool for self-assessment it can actively support the learning process of the students by providing instant feedback; secondly, as an instrument for teachers to facilitate automated exams in electronic form. While these two rather different types of applications share the same question pools and could therefore be easily combined, only one course of the whole curriculum actually offers both.

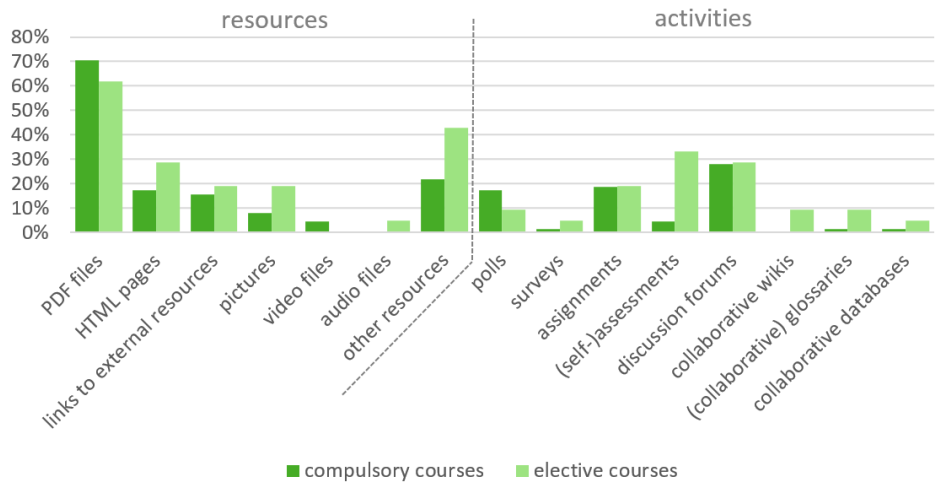

Figure 1: The use of e-learning in the courses of the Bachelor of Science programme "Forestry".

Table 1: The main fields of application for the Moodle activities "Forum" and "Quiz" in the Bachelor of Science programme "Forestry".

Activities		**compulsory courses**	**elective courses**
Forum			
	news forums	28,1%	19,0%
	discussion forums	20,3%	28,6%
	group discussion forums	1,6%	4,8%
Quiz			
	self-assessments	6,3%	19,0%
	exams	3,1%	14,3%

Some examples of e-learning in forestry education at BOKU

To complete the picture, it might be useful to highlight some courses and present how the responsible teachers deploy different online tools in order to support their teaching.

The course "Road Network Planning" combines lectures in the classroom with practical field work in the forest for several days. Since quite a number of technical aspects have to be covered, pictures and short movies of tools and machines provided in "BOKU learn" give the students an introduction to the topic. These extensive resources are accompanied by a library of manuals for the specific tools later to be used on the sites. The actual field work is supported by calculation tools realised with the help of Microsoft Excel spreadsheets. On completion of the course all students' projects are made accessible as downloads to the other students of this course.

A similar case is the course "Practical surveying: Field Course" which also contains practical field work for several days. A lot of resources like theory, GIS base data,

manuals for surveying instruments and background information are provided in the e-learning course. Furthermore a video tutorial explains how to set up a total station, which is an electronic theodolite with an electronic distance meter. For organisational purposes, such as group formation, transport, special diet or lost and found items, several forums and polls are used.

The course “Habitat suitability and biotope management” performs a peer-review process to produce short academic papers by the students in groups of two. The topics can be selected freely with the help of the Moodle “choice module”. The component next in line is the “workshop module”, that is the online activity where the group works are submitted and the actual process of peer assessment among the students of the course happens. The criteria are provided by the teachers. After revising their papers with the feedback given by their colleagues, the students upload their final versions into a database.

The course “General Botany” utilises a lot of different tools in various ways to supplement the face-to-face lessons which are recorded. In addition to the presentations and links to external educational videos, a text book and a glossary collaboratively written by previous years’ students are provided. Any mistakes or feedback can be reported with the help of a dedicated discussion board. Other forums are set up for organisational or topic related questions. During the semester several tasks like small studies or self-assessments are offered to elaborate on a voluntary basis, even though rewarded by bonus points that improve to some extent the overall rating of the course.

The course “General Chemistry” is shared with two other BSc programmes, it is therefore relevant for several hundreds of students. The lecture is recorded every three to four years, not only aiming at students who cannot regularly attend classes for various reasons but also serves as a basis for exam preparations. For activating students in the classroom the software based audience response system “BOKU vote” is used. The questions accompanied by up to six answers are displayed via video projectors and students can answer them with mobile devices like smartphones or tablet computers as illustrated in Figure 2. In addition, this mobile learning application delivers the teachers anonymous and instant feedback (Fels, 2008). The questions can be easily copied, thus making it easy for the teachers to measure the learning progress by using the same question at the beginning and at the end of a lesson.

Conclusions and outlook

The BSc “Forestry” offered at the University of Natural Resources and Life Sciences, Vienna (BOKU) blends traditional face-to-face teaching with online teaching and learning in many ways. The learning platform “BOKU learn” has become the basis for most of these activities. Over the last years lecture recording has been added to some courses. At about the same time, mobile devices like

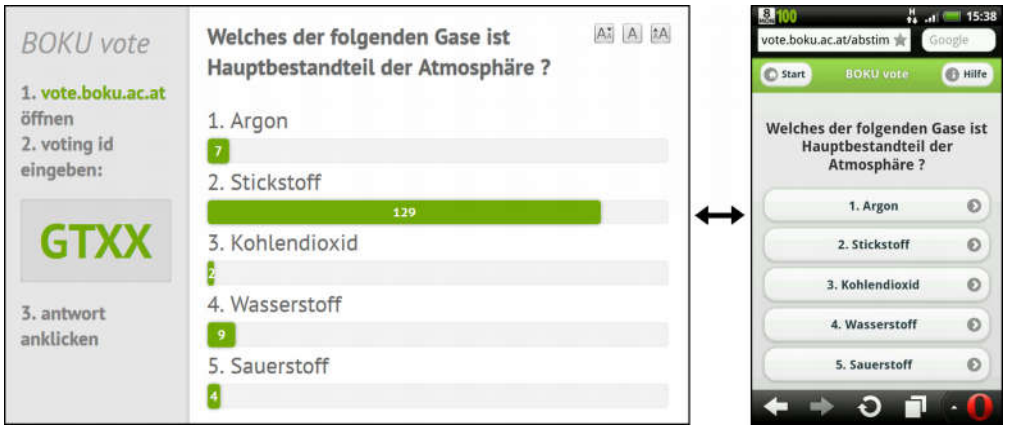

Figure 2: The presentation view of the teachers (left) and the smartphone view of the students (right) of "BOKU vote".

smartphones and tablet computers were beginning popular. First attempts to implement them as an addition to classical e-learning have been undertaken. The author believes that mobile learning has a great educational potential for most study programmes at BOKU. Further research is needed to identify those fields of application and adapt the educational concepts accordingly.

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QUALITY DEVELOPMENT IN TEACHING – OPPORTUNITIES AND LIMITATIONS RELATED TO THE TEACHERS' SELF-REFLECTION

ROLAND STÄHLI

Abstract
The aim of the here presented study was to examine how reflecting on lessons influences the further development of the teaching practice. In summary, the studied teachers' abilities to reflect on something can be described as diverse, broad, but not very well-structured. The teachers were committed to reflecting on their teaching style and generally have an open and positive attitude towards the concept of reflection. At the same time, it is emphasized that reflection is not easy without practice. The study made it clear that ability to reflect on something needs to be trained and encouraged extensively. Measures to do this can be appropriate instructions and aids (e.g. checklists and teaching journals), but also targeted training and further education courses. In addition, it appears to be sensible to reflect on collegial exchanges or coaching measures with which the effect of individual reflection could be increased. Improving teachers' abilities to reflect on something offers no guarantee for successful teaching, but it is a crucial prerequisite in order to make progress in everyday professional teaching in a conscious, targeted and knowledge-driven way.

Key words: Quality of teaching, self-reflection, teachers' abilities, improvement in classroom teaching

Stakeholders have to reflect upon their behaviour and decisions to improve the quality of teaching

Higher education as well as vocational education is facing important trendsetting decisions. How can they improve quality of teaching? Towards which direction are they developing? These question and many other issues of this conference need to be answered in a systemic way. The education in a specific country has to be understood as a system with clearly defined limits and basic conditions, with actors and their interdependencies. On the basis of such a systemic view of education, the following important findings can be deduced: Both, the external and the internal (institutional) basic conditions play a main role (i.e. legal regulations, financial situation/ type of organizing institutions of the education and their organization). But even more important than the framework conditions are the stakeholders in the middle of action, in other words, the persons within and around the process of teaching and learning. On the one hand, there are the students and their environments (parents, peers); on the other hand, there are the persons in charge of planning and realizing the process of teaching and learning (teachers, trainers,

masters of the practical training) and the decision makers from business and politics.

Many research projects have shown that teachers play a key role in the process of teaching and learning in higher education (Lipowsky, 2006; Good *et al.,* 2009). Together with other stakeholders, teachers define and work for the learning objectives, they decide on subject matter and methods and they occupy an important link function in many cases. Hence, they can make crucial contributions to the quality and the further development of a higher educational system, for example at university.

If we follow the research of Darling-Hammond (2006) we can clearly state that effective teachers engage students in active learning, create intellectually ambitious tasks, use a variety of teaching strategies, assess student learning continuously, adapt teaching to student needs and develop and effectively manage a collaborative classroom in which all students have membership.

Furthermore research findings showed that student learning gains are related to (Darling-Hammond, 2006):

- strong academic background of the teachers;
- quality preparation prior to entry into the studies;
- experiences as a professional teacher for more than three years.

In this context a professional teacher is considered as a person who has followed a teacher education programme and works regularly, more than 50% of a week in the classroom. Such teachers in general do have also the task to coach students and to realize administrative work for the own institution. To achieve better teaching performance the following points can contribute significantly:

- Teachers and school management have to create together clear and meaningful standards on teaching and learning.
- The institution (university) has to examine performance of the whole school with measures that look at practice, teacher, decision making and student work.
- The school management should plan the professional development of teachers (including evaluation, feedback and follow up coaching) and they should develop structures to support strong and sound professional decisions.

Do teachers know about the success factors mentioned above? Do we have clear evidence that teachers at universities fulfil such requirements? Are teachers willing to contribute to such measures? Are teachers even able to realize some activities to develop the quality of teaching on their own? These questions have been the starting point of our investigation.

Theoretical bases for a research project on teachers' self-reflection

Within a research project it was investigated, how teachers reflect upon themselves, their professional activities, their lessons and their surroundings (Stähli, 2014). Furthermore, it was analysed how reflections on quality in teaching influence the personal acting of the teachers and which roles they assume, i.e. for the decision making concerning quality in teaching.

To start the project the theoretical background was analysed. One of the key findings of reflection upon problem-solving processes consisted in the fact, that the high pressure of daily work induces teachers to choose simple and quick solutions for practical challenges, instead of enlightening the fundamental facts behind the problems (Bovet and Huwendiek, 2010). This observation underlines among other aspects the importance of reflection in daily work life (Wyss, 2013). As shown in literature, reflection will be successful, when individual processes are well planned, highly structured and adapted to real life context.

We have to be aware, that reflection
- Can take place in different ways;
- Can be carried out upon various contents;
- Can be realized using different procedures (as shown in Figure 1).

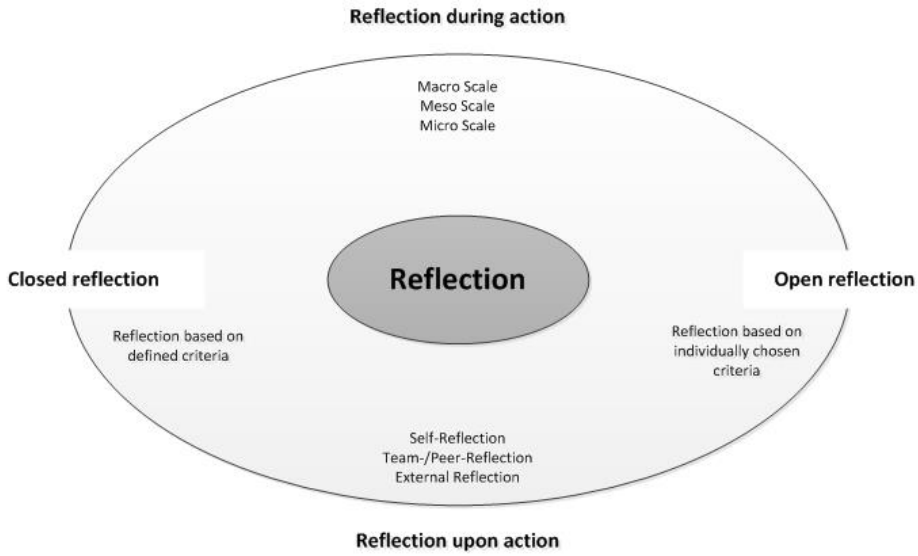

Figure 1: Different ways of reflection (Wyss, 2013).

Using self-reflection as a tool to analyse the actual situation is the base for consequences and further actions, which are implemented into practice. It occurs always under the inclusion of personal values, experiences and beliefs and with consideration of the larger context (theoretical, ethical, moral, and social aspects) (e.g. Dewey, 1933).

Systematically performed self-reflection leads to an increased understanding of the own functioning, of the personal abilities and of oneself. Thus, the teacher's own activities become 'visible' to him-/herself. Over a certain laps of time the own behaviour starts to become more predictable, different actions are linked with each other. This will also help teachers to interrupt automatically processed sequences of actions effectively. Once the own behaviour is better understood, actions can be steered into the required direction.

Therefore, alternative ideas of possible action patterns have to be planned. They can be based on previous positive experience or on theoretical knowledge (e.g. from learning psychology). Beside an improved quality of teaching, self-reflection can raise the own motivation and well-being in everyday life. The sensation of being in control of one's own behaviour and to be able to challenge and modify certain aspects of it has a motivating effect. Moreover, reflection contributes to the personal development (Calderhead and Gates, 1993). To create the process of reflection successfully, the person in charge has to be open-minded and needs to be able to take the responsibility of his action and the consequences. Furthermore, the respective person needs to be committed to the subject-matter he/she is reflecting of (Dewey, 1933).

Ability of reflection of teachers in agricultural education

Our qualitative investigation tried to show how teachers succeed to reflect their own lessons and their acting, taking the agricultural sector as an example (Stähli, 2014). Of particular interest was the issue how the reflection of one's own teaching will influence the development of future lessons. A design of qualitative research was developed for investigating this particular question. The idea came up to record the individual reflections (loud speaking) of nine teachers and to include at the end a detailed final discussion with the persons examined. The target group "teachers of vocational schools in agriculture" was chosen among other aspects because of the wide-ranging reforms concluded during the last years in the field of vocational education and training in Switzerland. Hence, the curriculum, the teaching materials and the evaluation procedure have been transformed.

The study showed that in general the teachers were able to reflect on their teaching. Their reflections covered a broad range of individual observations, opinions but also presumptions. The statements of the teachers referred mostly to didactical and pedagogical aspects that were closely linked with the observed lessons. Aspects regarding curricular models or motivation were seldom mentioned, whereas considerations of learning psychology were hardly ever made during the reflections. The reports on the performed lessons were mostly held in a descriptive manner and were related to a personal value judgement. Justifications based on references to literature hardly ever appeared in the investigated reflections.

Summing up, the teachers' abilities of reflection have been found diverse and wide ranged but poorly structured. The reflection focused mostly on the analysis and the valuation of the taught lessons. Development prospects have seldom been generated. The research on reflection and teaching quality located two main problems regarding the tested persons:

- Teacher hardly relate their teaching expertise with the corresponding theoretical knowledge.
- Although teachers are able to analyse their teaching in a detailed way, they hardly develop new ideas how to modify or improve their lessons.

The study made clear, that the teachers' abilities of reflection should be comprehensively fostered. Possible measures to be taken could consist in developing appropriated guidance and tools (e.g. check lists, portfolio…), but also in offering specific training. An additional contribution would be the exchange on experience among colleagues (peer feedback) or to think about support by coaching, to enhance the effect of the individual reflection.

In addition to the individual reflection, a final discussion with the teachers within the project allows to draw a positive conclusion. The tested teachers enjoyed reflecting on their teaching; they all did it in a committed way. They showed a positive and open-minded attitude towards the concept of reflection. Nevertheless, it was underlined several times, that a successful reflection needs to be trained. However, the question about an observable direct benefit of their reflection was not answered in a satisfactory way by the teachers. To realize successful self-reflection requires time and supporting measures such as a clear guidance. Above all, it has to take place only on a voluntary basis.

Recommendations and a view to the future

This study aims to point out the usefulness of (personal) reflection by teachers, school managers or scientists upon their own teaching. On the basis of these findings, five recommendations are drawn up:

- Self-reflection requires a structured approach divided into several steps. The first step starts by understanding the particular classroom situation and leads to the point (step two) where teachers become conscious about their individual concepts and their every-day theories and common beliefs. A third step intends to link the everyday vocabulary with scientific terms. This step leads to the fourth step, to an individual analysis of practical and theoretical knowledge of the teacher himself. Finally, the fifth step points out the most appropriate application or leads to concrete experiences.
- To develop the individual ability of reflection, a teacher has to be able:
  - To adopt an open-minded attitude.
  - To observe a teaching situation as precisely as possible.
  - To select specific aspects correspondingly and to analyse them in depth.

  - To develop concrete ideas how to modify his or her own behaviour or the whole lesson.
  - To include theoretical knowledge in his or her thinking and acting.
  - To implement the new ideas.
  - To assume responsibility for his or her own actions;
  - To evaluate the implementation of the new ideas and to decide whether to keep or to reject them.
- Aiming at a simplified concept of reflection (according Korthagen, 2001), a process of personal development is suggested. This process should be realized by teachers two times a year. The process includes the selection, the implementation and the evaluation of one specific idea or modification in the lesson (Korthagen and Vasalos, 2010).
- An appropriate procedure has to be developed by superiors to enhance and encourage reflective activities, especially for teachers. Possible measures are for example the use of mental tools for reflection (e.g. check lists, guidance).
- For the management of universities it is recommended to supply the necessary basic conditions, namely to establish an "institutional culture" which fosters reflective activities as an important element of the individual and professional development.
- Improving teachers' abilities to reflect on something offers no guarantee for successful teaching, but it is a crucial prerequisite in order to make progress in everyday teaching in a conscious, targeted and knowledge-driven way. This objective cannot be ignored by university teachers who put their students' learning success in the heart of all their efforts.

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GENERAL DISCUSSION

SANNE VAN DEN BERGE AND LOTTE VAN NEVEL

At the end of the meeting a short but intensive free discussion with all participants was held. No general conclusion was striven for, neither obtained. However, nearly all participants contributed to the discussion. A short report can be read below.

Statements

- How to reflect practice orientation in the examinations?
- What are the possibilities of models and systems (to integrate practice orientation in the course) for teachers?
- In which time gaps can the practice training be guaranteed? How to deal with it?

The first 3 statements were not further discussed.

- What are the core competences of 'classic' universities versus universities of applied sciences? This statement was the core of the discussion. The further content illustrates the arguments in this context.
- We need a clear concept of the competences of both study programmes and how they can be integrated.
- It is important that the requirements of our society are implemented in the curricula, BUT as the society (and the job requirements) is changing, we should not lose sight of the basic sciences (social and science courses).
- What does an employer expect from a forester?
  - a forester should remain a forester!
  - high importance of basic knowledge and expertise!
- Forestry education should be very broad as foresters are confronted with many fields (social, legislation, economics, administration, ecology, international orientation, …).
  - Nowadays, there is a trend that foresters are under-represented in landscape planning projects. Why?
    - the number of other broad-oriented study programmes is expanding our forestry education might be too specific as compared to that of landscape planners / geographers.
    - the number of other broad-oriented study programmes is expanding.
  - How to deal with it?
    - this is all about competition. Maybe we should just accept this development, as competition is a given fact in our society.

    - however, this competition emphasizes the need to keep core knowledge in the forestry sector, to be able to compete with the other specialists (no more outsourcing). This counts for both 'classic' universities and universities of applied sciences.
    - moreover, it also shows us the importance to keep on communicating about the content of the curricula AND to keep on collaborating in forestry networks such as the SILVA Network.
- The challenge is to find a good balance between theory and practice.
- The bachelor curriculum is quite short as compared to the expected content, so it should be efficient.
- We can't cover everything during the study period. As the future job is unknown, the expectations of future employers are unknown. => Transferable skills (which will always be needed) are of high relevance. Teaching in an exemplary way can be a good way to attain this goal.
- It is very important to keep contact with the practice by consulting all stakeholders on a regular basis. This could be done e.g. by organizing a programme committee which discusses the study programme and sets the medium term expectations.
- From a social point of view, it is inevitable to keep in mind that practice and problem orientation are interrelated with the organization of the society and the society problems.
    - the necessity of communication (about forest management) is underestimated and under-represented in our curricula.
    - Master students (of both 'classic' universities and universities of applied sciences) are not very well prepared to counter societal problems.

- So far, it is obvious that both (from 'classic' and from applied sciences universities) study programmes could be improved. However, a part of the discussion was also about the comparison of the classic education versus applied education. The main arguments concerning academic education versus practical training:
    - the question is raised whether students will need the academic knowledge in their future jobs?
    - generalists versus specialists? Generalists are disappearing but they are also needed!
    - universities of applied sciences solve the problems of today and tomorrow, whereas 'classic' universities solve the problems of tomorrow and after tomorrow.
        - Both are needed.
        - Do we actually have to discuss the differences between 'classic' universities and universities of applied sciences…? In the end, it is up to the students to choose what they want.

CONCLUDING REMARKS

SIEGFRIED LEWARK

Practical relevance of forestry curricula is of fundamental importance, there is no doubt about that, both at universities and universities of applied sciences. What is of practical relevance? Heinimann defined in his contribution at the beginning of the conference (Heinimann, 2014):

- What enables graduates to solve real world problems.
- What enables graduates to contribute to the survivability of a firm/sector.
- What people perceive as relevant in their current working context.

It seems easy to imagine what this may mean for forestry or forest science curricula, but of course it has to be elaborated in some detail. And next: How to translate this into expected learning outcomes – and how to achieve these? And then: Are there fundamental differences between universities and universities of applied sciences in this respect?

We certainly got some answers during the conference, which we also can read in the texts of these proceedings. It is confirmed many times that practice orientation is fundamental, both at universities and universities of applied sciences, and it is consciously worked for in these institutions. The authors describe many types of courses and only refer to contents when giving specific examples. The courses they name are in most cases problem oriented, working on tasks and aiming at elaborating results, which are presented to peers, teachers and often also to practitioners. These courses are organised as projects for individual students or groups, the reason mentioned is preparation for practical working life. The picture we see may indicate a dominance of such projects as compared to conventional teaching, but this may be due to the intention of the authors to present good examples of practice orientation according to the topic of the conference.

The description of these learning and teaching projects in the texts of the proceedings show no clear differences between universities and universities of applied sciences, which does not exclude the possibility of differences in the learning and teaching practice. Obviously there are clearer differences between Bachelor and Master study programmes at both types of institutions. But from the texts we can only conclude on a greater share of compulsory courses in the Bachelor programmes, not so much on the differences of didactical approaches between Bachelor and Master programmes.

We must realise that, as at earlier conferences of SILVA Network, the contributions come from committed teachers and reflect their experiences and positions as well as their views of the reality at their institutions, and partly the official positions of these institutions. The students this time focused mostly on concrete experiences in

international study programmes. The positions of other stake holders – in particular of graduates and employers – come into the view only in an indirect way. Also as earlier, reference is mostly made to the perceived reality and not so much to theory, with the exception of the text on the role of reflecting on lessons and its influence on the development of the teaching practice (Rosset, this volume).

Most teachers in forestry study programmes know criticism from forestry practice, that teaching and thereby the competence of graduates is too theoretical and too far from real problems and tasks of working life. The contributions of the conference do not support this, if we follow the definitions we used for practical orientation. Similarly forest science scientific research applies to practical tasks and looks for solutions using scientific methods, which demonstrates practice orientation of research, and thereby of the institutions.

In general we perceive, when looking back at earlier conferences of SILVA Network, a shift of focus from contents of study programmes to the organisation of courses, with a growing weight of learning organised in the form of projects.

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PARTICIPANTS

Alder, Michael alder.michael@bluewin.ch
Hochschule für Agrar-, Forst- und
Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Baerlocher, Bianca bianca.baerlocher@bfh.ch
Hochschule für Agrar-, Forst- und
Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Dubbel, Volker dubbel@hawk-hhg.de
Hochschule für angewandte Wissenschaft und Kunst HAWK,
Busgenweg 1A, 37077 Göttingen, Germany

Eid, Tron Haakon tron.eid@nmbu.no
Norwegian University of Life Sciences
P.O.Box 5003, NO-0032 Ås, Norway

Günther-Dieng, Klaus Klaus.Guenther-Dieng@hnee.de
Hochschule für nachhaltige Entwicklung HNE
Schicklerstrasse 5 16225 Eberswalde, Germany

Heath, Simon clues@abdn.ac.uk
ICA- Association for European Life Sciences Universities
Czech University of Life Science Prague
Kamycka 129, 16521 Prague, Czech Republic

Heinimann, Hans Rudolf hans.heinimann@env.ethz.ch
Eidgenössische Technische Hochschule ETH,
Universitätstrasse 16, 8092 Zürich,Switzerland

Kern, Maren maren.kern@bfh.ch
Hochschule für Agrar-, Forst- und
Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Leu, Fabian fabian.leu@gmail.com
Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

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

Michalek, Claus-Rainer claus-rainer.michalek@boku.ac.at
BOKU, Augasse 2-6, 1090 Vienna, Austria

Müller–Starck, Gerhard gerhard@mueller-starck.de
Chair for Forest Genetics, Technische Universität München
Am Hochanger 13, 85354 Freising, Germany

Pauli Bernhard bernhard.pauli@bfh.ch
Hochschule für Agrar-, Forst- und
Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Pfannkuch, Markus markus.pfannkuch@gmail.com
Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Rommel, Daniela daniela.rommel@bfh.ch
Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Rosset, Christian christian.rosset@bfh.ch
Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Rothe, Andreas andreas.rothe@hswt.de
Hochschule für angewandte Wissenschaften Weihenstephan-Triesdorf
Hans-Carl von Carlowitzplatz 3, 85354 Freising, Germany

Ruge, Stefan ruge@hs-rottenburg.de
Fachhochschule für Forstwirtschaft HFR,
Schadenweilerhof, 72108 Rottenburg a.N., Germany

Schaller, Markus markus.schaller@bfh.ch
Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Schmidt, Pieter pieterschmidt102a@gmail.com
Chair of Forest Ecology and Forest Management,
Wageningen University
P.O.Box 47, 6700 AA Wageningen, The Netherlands

Stähli, Roland roland.staehli@bfh.ch
Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Thormann, Jean-Jaques jean-jacques.thormann@bfh.ch
Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften,
Länggasse 85, CH-3052 Zollikofen, Switzerland

Van den Berge, Sanne Sanne.VanDenBerge@UGent.be
Ghent University, Coupure links 653,
B 9000 Ghent, Belgium

Van Nevel, Lotte Lotte.VanNevel@UGent.be
Ghent University, Coupure links 653,
B 9000 Ghent, Belgium

Weber, Michael m.weber@forst.wzw.tum.de
Technische Universität München,
Hans-Carl von Carlowitzplatz 3, 85354 Freising, Germany

Weber, Norbert nweber@forst.tu-dresden.de
Chair of Forest Policy and Forest Resource Economics
Technische Universität Dresden,
Piennerstrasse 8, 01737 Tharandt, Germany

Wettklo, Lisa lisa-wettklo@posteo.de
Fachhochschule für Forstwirtschaft HFR,
Schadenweilerhof, 72108 Rottenburg a.N., Germany

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

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

Year	Location	Title	Editors	Published in, as
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

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