ROSE WOOD
4.0 Sustainable Wood for Europe

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Abstract

This deliverable is part of the ROSEWOOD4.0 work package 3.

This report is structured in a general part, in which e-learning terms are defined and the didactic background of (digital) forest training is assembled based on a literature study. Then it follows a summary of tools that can be used to produce digital learning content. This compilation is intended to help organizations to produce digital learning units by themselves.

In chapter 3, all the lessons learnt by the ROSEWOOD4.0 partners involved in the production of the three MOOCs are summarized. This is done from the perspectives of the course participants, the trainers and also of the organization that provides the forest education courses. The ROSEWOOD4.0 project experiences are complemented by scientific study material, as well as practical recommendations from educational institutes outside the ROSEWOOD4.0 project.

To finalize, this report is concluded with a chapter on recommendations and conclusions.

1. Introduction

During the ROSEWOOD4.0 project, available vocational and industry relevant education programs were screened and documented. Additionally, a series of MOOCs were produced and tested.

This document reflects the lessons learnt and summarizes the do's and don'ts. What became obvious during the work is that a lot of new ground must be broken in the technical area when moving to blended learning and that this takes a lot of time. That is why this document includes a summary of tools that may help to get started.

2. Didactic and technical background

2.1 Definitions of terms

Blended learning	Combination of e-learning and face-to-face learning, also known as hybrid learning. A proportion of 30-79% of online content is sometimes used to distinguish blended learning from other course forms (Allen et al. 2007).
E-learning	E-learning is the use of information and computer technologies (ICT) for learning. The spectrum goes from supported learning to blended learning to learning entirely online.
Flipped classroom	The lecture is recorded on videos, which the students watch in preparation. The time gained can be used in classroom teaching with activating methods to deepen and apply what has been learnt.
LMS	_L_earning _M_anagement _S_ystem is a software for the digital provision of learning content and the control of learning processes.
MOOCs	_M_assive _O_pen _O_nline _C_ourses are free online courses available for anyone to enroll. MOOCs provide an affordable and flexible way to learn new skills and deliver quality educational experiences at scale. A MOOC combines various digital materials and social media tools as part of a didactic overall concept. Typical components are e-lectures, forums, wikis and online testing. (Sources: https://www.mooc.org, https://oer-schweiz.ch/)
Online course	A course that is taught totally online (in contrast to hybrid or blended course).
Webinar	A webinar is a form of one-to-many communication: a presenter can reach a large and specific group of online viewers from a single location. Participants follow webinars via a computer or smartphone.

2.2 Didactic of e-learning

2.2.1 Blended learning

Müller and Mildenberger (2021) did a systematic review on the effect of blended learning. They investigated if reduced classroom time, as a result of replacement with online content, had a negative effect on the learning outcome. They found that blended learning had little effect on the learner's outcome.

Blended learning mixes instructor-led classroom training with online content. Blended learning represents a shift in instruction methods. Because digital material is integrated in the learning process, it is possible to use

the most appropriate medium for a topic at a particular stage in the training. Blended learning can expand the range of visual, auditory, and kinesthetic learning to better support learners' individual learning needs.

Blended learning is not about the technology itself. Digital content is only one part of the equation and the focus should be on the shift in instructional models toward student-centered learning (Watson et al. 2015). In combination with personalization students may get the choice in how they learn, what they learn, when they learn, and where they learn.

Administrators recommend using professional development opportunities to help staff understand the systemic differences of blended learning. Teachers must learn how to balance providing instruction online with traditional face-to-face activities (Watson et al. 2015).

Implementing blended learning is a complex program of work, requiring integrated plans around teaching and learning, information technology, finance, human capital, and communications (Bailey et al. 2013). At the beginning of the implementation, the actual situation should be analyzed, goals should be defined, and the funding must be clarified.

To access and compare the extent of blended learning a radial diagram is used by Engelbrecht and Harding (2005). The top three elements summarize the amount of interaction and the bottom three the amount of online material. The blue area in the diagram indicates the extent of internet utilization. A larger area does not necessarily mean a better course.
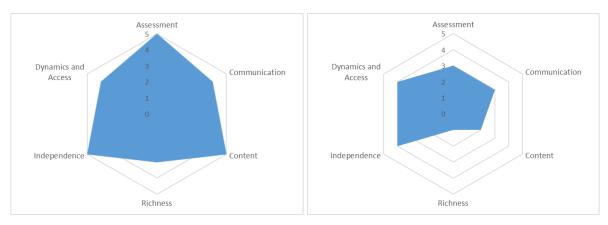

Figure 1: Example of how two blended learning courses can be compared (Source: Engelbrecht and Harding (2005))

Scaling used in Figure 1:

Dynamics and Access: What is the frequency of access necessary for success in the course?
1=once per term, 2=once per month, 3=once per week, 4=2-3 times a week, 5=daily

Assessment: How much of the assessment is done online?
1=little, 2=almost half of it, 3=more than half of it, 4=most of it, 5=all of it

Communication: How much of the communication happens online?
1=little, 2=almost half of it, 3=more than half of it, 4=most of it, 5=all of it

Content: How much of the course content is available online?
1 each for book, course information, course administration, lecture notes, study objectives, with a maximum score of 5.

Richness: How many enriching components does the online part of the course have?
1 each for a computer algebra system, graphics, java applets, slide presentations, video clips, and sound clips; in effect, more than text communication, with a maximum score of 5 components.

Independence: How independent is success in the course from face-to-face contact?
1=Fully contact lecture and tutorial driven; website an add-on, 2=Contact lectures but web-based tutorials or assessment, 3=Limited regular contact, 4=Sporadic contact, 5=No face-to-face contact

2.2.2   Flipped classroom

Flipped classroom is one form of blended learning. It is widely used in the US, whereas in Europe it is not yet used by many institutions (Kenner and Jahn 2016). Large parts of traditional face-to-face teaching are replaced by e-learning modules or videos. Knowledge acquisition of the students increasingly takes place in self-study. This part is put at the beginning of the learning unit and then followed with a classroom part where students will deepen their knowledge and practice together. For the self-study part it is crucial that learners have received clear assignments (Ziesak and Rosset 2016).

Formative assessments are used in various forms in the self-learning and attendance phases to determine the learning status and to provide feedback. The teacher can use the results of the tests to tailor the attendance phase to the needs of the students. During the face-to-face phase action-oriented, collaborative, and cooperative forms of learning are particularly suitable. Concepts such as "learning through teaching", "learning through playing" and "learning through discussion" are often used. The instructor largely relinquishes the role of mediator and expert and acts more as a coach or learning advisor (Kenner and Jahn 2016). Zainuddin and Perera (2017) did a study on self-determination in a flipped classroom situation and found that the flip-class environment increased the students' intrinsic motivation. The students were motivated by the video-recorded lectures, self-regulated learning environments, engagement in class activities and peer interaction.

2.2.3   MOOC

MOOCs cover a wide spectrum of subjects and are usually offered by universities in association with LMS providers. Generally, MOOCs carry no tuition fee and mainly need student's interest in the subject and a good internet connection (Goel and Goyal 2020). Exams in the course are optional. However, providers often charge fees for exams and/or for issuing certificates.

Cormier and Gillis (2010) define a MOOC in a broader way as an event that engages people about a topic they care about and work and talk together in a structured way. It is not about completing assignments but rather engaging with the material in the course, on the web and engaging with other participants. The network built up during the course is a main outcome of the MOOC.

MOOCs modify learning methods and give access to quality resources to a larger population over more flexible hours (OECD 2017). Flexibility of time and place appears to be particularly important for the continuing education of working people. Adults in the forestry sector, who often live and work far from bigger cities, therefore seem to be a predestined target group for MOOCs.

MOOCs have an extremely high dropout rate of over 90%. The reasons are manifold but most fall in the categories listed in Table 1. Suggestions to reduce the dropout rate are listed in Table 2.

To address the student-related factors before someone signs up for a class, a clear description of the learning content, the required time and prior knowledge should be stated in the course description (Figure 2).

Student-related factors	MOOC-related factors	Other factors
lack of motivation	course design	casual enrollments
lack of time	isolation and lack of interactivity	peer review
insufficient background knowledge	hidden cost	

Table 1: Reasons for low MOOC completion rate (Source: Goel and Goyal (2020))

Key word	Explanation
Course design and instruction	The course should be well-designed and focus on interactivity. It should include several topics for discussion, accept learner and expert feedback and link sources that promotes increased participation. Constructivist learning [1] should be part of the learning concept.
Interaction among learners	Interaction with other learners is a crucial factor in sustaining engagement in the course. The course forum and social tools could be a potential solution for MOOC students to stay motivated.
Comfort level with technology	In MOOCs students should receive technical training on how the learning environment works and how to perform necessary tasks.
Assessment or feedback	Feedback is important for educational learning. Feedback in an online course should not be delayed by more than 48 hours. Students that feel connected to the learning environment and their instructor are less likely to drop out.

Table 2: Areas to reduce dropout rates (Source: Goel and Goyal (2020))

[1] Constructivist learning means development of knowledge through interaction with the physical and social environment (Powell and Kalina (2009)).
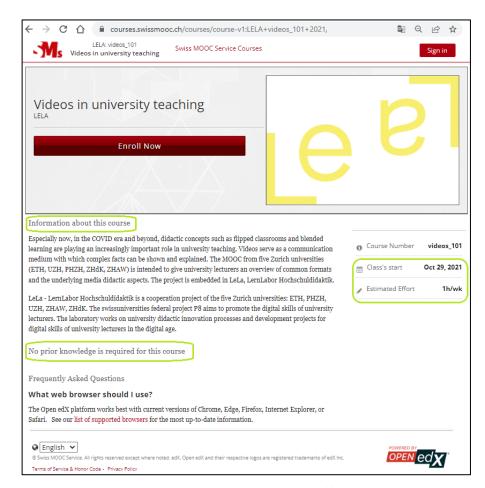

Figure 2: Example of a MOOC sign up page (Source: https://courses.swissmooc.ch/)

2.2.4 About videos

Videos are a widely-used resource for online learning. Noetel et al. (2021) found in a meta study that videos usually improve student learning in higher education. Compared to a textbook or a podcast, a video addresses more than one channel of the learner. The effectiveness of a video however depends on the possibility of the learner to interact (with peers, teacher or even with the video itself (e.g. https://h5p.org/interactive-video). It is the task of the teaching organization to design a learning environment that promotes learner interactions.

Because videos can be edited, content is often more coherent than in direct teaching and a video is likely to be more time efficient. A well-done video provides more time for interaction.

Videos are probably more effective in teaching skills than knowledge. In contrast to a class room demonstration the students can see an authentic demonstration of skills with real people in a video from a favorable position (Noetel et al. 2021).

Guo et al. (2014) analyzed almost 7 million MOOC video watching sessions and came up with the findings and recommendations in Table 3.

Finding	Recommendation
Shorter videos are much more engaging.	Invest heavily in pre-production lesson planning to segment videos into chunks shorter than 6 minutes.
Videos that intersperse an instructor's talking head with slides are more engaging than slides alone.	Invest in post-production editing to display the instructor's head at opportune times in the video.
Videos produced with a more personal feel could be more engaging than high-fidelity studio recordings.	Try filming in an informal setting; it might not be necessary to invest in big-budget studio productions.
Khan-style [1] tablet drawing tutorials are more engaging than PowerPoint slides or code screencasts.	Introduce motion and continuous visual flow into tutorials, along with extemporaneous speaking.
Even high-quality pre-recorded classroom lectures are not as engaging when chopped up for a MOOC.	If instructors insist on recording classroom lectures, they should still plan with the MOOC format in mind.
Videos where instructors speak fairly fast and with high enthusiasm are more engaging.	Coach instructors to bring out their enthusiasm and reassure that they do not need to purposely slow down.
Students engage differently with lecture and tutorial videos	For lectures, focus more on the first-watch experience; for tutorials, add support for rewatching and skimming

Table 3: Findings and recommendations on videos in MOOCs (Source: Guo et al. (2014))

(1) A Khan-style video is a full-screen video of an instructor drawing freehand on a digital tablet.

2.3 Tools to host and produce learning content

The market for computer tools is very volatile. Software that is used a lot today may no longer be available tomorrow. A list of software and tools for learning content becomes outdated very quickly. Nevertheless, a short list is made here to make it easier to get started.

2.3.1   Learning platforms

A learning platform is more than just a document repository. Students and course participants use it to solve tasks, ask and answer questions, work on documents together, comment on work by fellow students, participate in forums, carry out self-checks, complete tests, take part in voting, receive feedback, evaluate modules, and much more.

ILIAS	It is an open-source learning management system (LMS) that was developed in Germany and is used by universities, businesses, schools, and public authorities. ILIAS is web-based and neither students nor teacher need to install extra software. Course management, learning modules, tests and assessments, portfolios, surveys, wikis, blogs and chats are available. Import of learning modules from other learning platform formats is possible. Hosting of the service can be done by any organization but is also offered by some universities or private companies (Source: https://www.e-teaching.org/technik/produkte/iliassteckbrief, see https://www.ilias.de/en/).
Moodle	It is an open-source learning management system (LMS) that was developed in Australia and is used by universities, businesses, schools, and public authorities. Moodle is web-based and neither students nor teacher need to install extra software. Moodle allows effective online learning courses to be created and offers a wide range of learning resources and activities such as web questionnaires, blogs, wikis, lessons, and so on (see https://moodle.net).
Open edX	It is an open-source learning management system (LMS) that was developed by Harvard University and MIT for the learning platform edX. It empowers organizations worldwide to design customized and engaging online learning platforms. MOOCs with virtual classes and training programs can be hosted (see https://openedx.org/).
Coursera	It is an open-source learning management system (LMS) that has its roots at the Stanford University. All content is created by the partner universities. Coursera manages and streams this content. Participation in the courses is free of charge, but a fee is charged for official certificates with identity verification. The courses usually consist of several hours of video lectures combined with performance reviews (see https://www.coursera.org/).
Udacity	It is a private online academy and platform for MOOCs that has its roots at the Stanford University. Together with partners the company is developing courses that are intended to combine traditional education with professional skills (see https://www.udacity.com/).
Others	The are many more LMS available and the "market" is volatile. Here follows a loose collection of other LMS resources: Blackboard (https://www.blackboard.com/), CLIX (https://www.im-c.com/en/), OLAT (https://www.openolat.com/), Stud.IP (https://www.studip.de/), Chamilo (https://chamilo.org/en/)

2.3.2   Tools for screen recording

OBS	Open Broadcaster Software is a free screen video recorder that offers both recording and streaming in high definition, with no limits on the length of your videos.

Screencast-O-Matic	Online screen recorder (free with watermark) and video editor (small fee) that supports webcam and screen recordings.
Bandicam	Screen recording application that supports screen and gameplay capturing. In the free version there may be a watermark in the recording.
Camtasia	Screen recording option and a plug-in into MS PowerPoint that allows to record your presentation.
ShareX	Open-source screen recording that allows video capturing.
ScreenRec	Free screen recorder that lets you capture your desktop in one click.
QuickTime Player	Screen recording and simple post-processing of videos for iOS.

2.3.3 Tools to produce videos

Raw material for a video can come from a professional camera, a smart phone, a screen recording or various sources in the web. To take out a film, a tripod is highly recommended. Without a tripod, a stabilizer function should be active if possible.

For any video material it is important to respect people's privacy and copy rights. For external videos consider to just provide a link instead of a copy.

Movie Maker	This is a free video editing software from Microsoft that provides basic functions for creating movies and music. The operation is intuitive.
Avidemux portable	This is a free video editor designed for simple cutting, filtering, and encoding tasks. It supports many file types. It is possible to make stop motion movies.
Camtasia Studio	This is a video editor that needs a license. It is easy to learn and use with many instructional videos available.
Pinnacle studio	This is a video editor that needs a license. It is mainly used by beginners and semi-professional users and offers many functions in the process.
Adobe Premiere Pro	This is a video editing software that needs a license. Its functionality reaches a professional standard. Using it is already a bit more demanding than the previously described programs. With Adobe Premiere Elements a simplified version is available.
iMovie	Easy-to-use video editing program from Apple. Free on Mac, small fee on iPhone/iPad.

There are many suitable teaching and learning videos to be found on the Internet. If such are used for teaching, there is the following didactic recommendation:

- Short videos of up to 1 minute are often suitable for activation on a specific question.
- Videos of more than 3 minutes should have one or more observation assignments in advance.
- Videos of more than 5 minutes should be linked to questions or tasks (e.g. summaries).

2.3.4 Tools to produce audio

Audio can either be used by itself, for example as a podcast for course participants or it can be integrated into videos. For good audio recordings a good microphone should be a high priority. Currently available

smartphones normally have good microphones and are therefore suitable for sound recordings for teaching material. Headsets are often less suitable, as the existing microphones are placed close to the mouth and pick up breathing noises.

Audacity	This is a free and versatile podcast recording tool that allows users to record, edit and manage audio records. It is free for its users while being a cross platform audio software compatible with Windows, Mac OS, Linux and other operating systems. Some of its major features are sync lock, truncate silence, silence finder and more. Audacity is regularly updated to suit all latest versions of systems.
Skype	This is a free audio and video recording tool.
Zoom	This is a free audio and video recording tool.
Recorder, etc.	On smart phones a audio recording app is normally preinstalled or can be found in the app store.

2.3.5   Tools to convert speech to text

Speechtexter	SpeechTexter is a free multilingual speech-to-text application aimed at assisting you with transcription of any type of documents, books, reports or blog posts by using your voice. (https://www.speechtexter.com)
Gboard	With Google Keyboard you will have an instant text-to-speech app.
Transcribe	Transcribe is a personal assistant for transcribing videos and voice memos into text (Apple only, see app store).
YouTube	If you have a video from which you want to extract the spoken text, try the following: 1) upload the video to YouTube, 2) do not publish it but wait until the subtitles are generated, 3) download the subtitles

3. Lessons learnt

3.1 Learner's perspective (on blended learning)

3.1.1 Self-management

E-learning provides flexible learning, which is a clear advantage over traditional learning in class. In e-learning programs, the participants have a high flexibility. There are no fixed class times and accordingly time management is largely the responsibility of the learners.

How this responsibility is handled depends in part on the personality of the learner, but it can and must also be learnt. In the school setting, younger students are given little freedom to learn on their own and older students are given more freedom.

If blended learning courses are offered to adults, it cannot be assumed that they will be good at self-directed learning. This is an aspect that should be considered in the target group analysis.

3.1.2 Learning outcome

For the ROSEWOOD4.0 project three MOOCs have been developed and conducted at the Forestry Education Center North Rhine-Westphalia (FBZ). However, these courses did not have built-in tests to monitor learner success. Therefore, it is not possible to determine the actual learning success of the course participants.

3.1.3 Feedback from participants

The flexible and time-independent preparation of the MOOC part of the training (videos, podcasts, PDF etc.) was highly appreciated by the participants. Short and self-contained learning units and videos are preferred over longer units. The combination of a self-paced learning with a scheduled webinar or onsite event gives motivation to really work through the self-study material. Because the participants come prepared to the onsite training, this event can be shorter (e.g. a half day or a full day) and it is therefore easier for the participants to get permission to attend the course during working hours.

Dealing with the ILIAS platform and with the course navigation was rated as easy. Registration on the platform is perceived as simple and unproblematic. The need for registration together with the hosting by a public authority increases the trust into the provided contents. The content was perceived to be applicable to the local forest and was therefore considered valuable. It seems important that the local language with the specific forest vocabulary is used. Additionally typical landscape and vegetation or even legislation aspects need to be considered when transferring training material to a different environment.

Feedback from the course participants of the MOOCs was collected. The participants could comment on each of the online and on-site modules. The feedback of the participants was used to improve the subsequent courses.
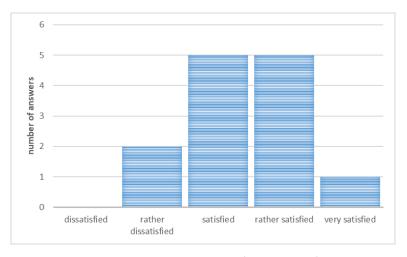
Figure 3: Example of MOOC module evaluation (Source: FBZ)

3.2 Trainer's perspective

3.2.1 Preparation of content

The preparation of the trainings in the ROSEWOOD4.0 project was a huge effort. The trainers report that because the whole learning concept was new there was a lot to be learnt and new tasks and skills were required. The initial planning and the script for the course and the individual recordings requires a lot of time, whereas the actual implementation was less elaborate than expected. However, recording of the videos was laborious, especially when working with external experts and when there are high quality expectations. Transcribing spoken text was initially done manually, which is time consuming. Over time, voice to text tools were also used, which is much faster. However, the tools had problems with the speech of people with strong dialect. In any case, the texts must be checked and finished manually. The transcripts were mainly required because of the intention to translate the course material into other languages.

The lecturers and teachers were able to see that they themselves were becoming more competent during the preparation and implementation of the first course. The initial skepticism is therefore reduced.

The interaction with professional film teams is rated positive and educative. From a trainer's perspective involving professionals is a requirement if high quality course material shall be produced.

3.2.2 Experience with participants

The course participants come prepared to the face-to-face training, which is highly appreciated by the trainers. It looks like the participants come to class more confident and at ease, as they already know in more details what to expect from the onsite training. This resulted in greater rapport and trust between the participants and the trainers. Because the face-to-face part was shorter the participants had less trouble with staying away from their workplace.

3.2.3 Feedback from trainers

The trainers report a huge effort for the preparation of the course content, which is not surprising because the new course was made from scratch. Face-to-face teaching has been shortened, which is viewed positively by teachers. It seems that now participants can attend the courses who would otherwise not be able to due to time or cost constraints.

In the ROSEWOOD4.0 project the trainers did not interact with the LMS. Uploading content, structuring the course, and administrating the participants was done by a central person. With this solution the trainers were happy because they believe that the operation of the LMS is laborious and difficult.

3.3 Organizational perspective

3.3.1 Efforts on the organizational level

At the management level of an organization, positive effects of blended learning are expected. These expectations range from positioning the organization as an innovative institution to addressing new target groups (especially in vocational training), to more effective resource utilization and cost savings.

The use of technology for new forms of learning should not be underestimated. What is needed is an appropriate allocation of resources and investments in infrastructure and support units. There is also often resistance to change and innovation. The change away from familiar forms of teaching is time-consuming and requires coordination processes within the organization. (Source: https://www.e-teaching.org/)

When an organization that has offered conventional courses increases its reliance on electronic content, the impact is felt in several places. Investments in infrastructure, personnel and administration become necessary. It is therefore important to precede the transition with an evaluation phase, furthermore a concept and/or a new strategy needs to be developed. Creating an institutional strategy for e-learning is reported to be one of the biggest challenges, together with staff workload management (Kear and Rosewell 2018).

3.3.2 Learning platform

The LMS used in the ROSEWOOD4.0 project was ILIAS. A central administrator was used to handle user management and to ensure a consistent layout. Teachers were also instructed by the administrator on how to use the system. The overall experience with the LMS was positive and feedback from course participants confirmed that the handling did not cause any problems.

3.3.3 Replication and rollout to new region

The ROSEWOOD4.0 MOOC 2 was repeated twice after the first execution. The possible expectation of a fast payback of the extra effort for digital learning material production was not met. Because of the interaction during the online part and because of the face-to-face event, the personnel effort of a course execution is only partially reduced. It is estimated that the new form of blended learning could reach its brake even only after about 20 course repetitions.

Adapting the three MOOCs for other regions primarily meant translating the content linguistically. In the first step, German sequences were translated into English and then into more than ten other languages. The effort for these translations was very high. At various replication events, the adapted course content was tested and found to be good.

4. Recommendations and conclusions

4.1 Do's and Don'ts

The introduction of blended learning is a big step for an educational organization. It is therefore recommended to start a pilot program and make first experiences with only a few courses. This can be a steppingstone for a broader implementation (Watson et al. 2015).

Target groups for forestry training can be very different. It is therefore useful and important to categorize the desired participants and adapt the course content accordingly. Possible criteria are age, gender, background, public or private, owner or employee, interest field (wood, biodiversity, technic), media type, position in value chain, hierarchy (trainee, lumberjack, forester, owner, state), course type (vocational, university, other), provider (public or private, small or large).

It is important to ensure that adults with weak literacy and digital skills can easily take up opportunities to improve their skills so that they too can participate fully in society and share in the benefits that information and other technologies can bring (OECD 2017). It is therefore recommended that the instructions for the use of the online resources are available at the beginning of courses and a working support system is in place. This will especially benefit people with little computer experience.

A high level of interaction (teacher-student and student-student and feed-back) increases the success of e-learning. An LMS should allow each student to monitor his or her learning progress. (Olsen et al. 2004).

Over the duration of the course move from high levels of guidance and instruction (making sure they have the skill and ideas scaffolding to work on) to lower levels of guidance and more student directed work (TeachOnline.ca 2013).

The estimated number of hours of duration for an e-learning course should be clearly stated in the course description. All fixed dates and times where direct participation is required should be indicated in advance. This helps avoiding a source of dropout reasons.

Prior to the course announcement, consideration should be given to how existing and possible new target groups can be reached.

Infotainment (YouTube, podcast, etc.) can lower the barrier for open participation.

If it is possible to obtain course credits from multimedia courseware, the students' acceptance of e-learning and their motivation will increase, because the individual benefit is clear (Frommann and Tan 2006).

4.2 Conclusion and outlook

An industry-specific language is spoken in the forest sector. In addition, forest workers and owners are often not fluent in foreign languages. It is therefore essential that learning units are available and taught in the local language.

Translation of available learning material can be a huge work.

Time flexibility seems important for the decision to enroll in a training, maybe more than geographical independence. Students preferred to move at their own pace even though this required a high degree of self-management. They did not want to be locked into completing assignments at the same time as others and wanted to be able to move ahead in their courses at their own pace. The literature showed that online instruction is welcomed by students because it provides learners with convenience and autonomy.

Not surprisingly, students in well-designed and well-implemented online courses learnt significantly more, and more effectively, than those in online courses where teaching and learning activities were not carefully planned and where the delivery and accessibility were impeded by technology problems (Tallent-Runnels et al. 2006).

For the didactically meaningful design of blended learning, the same considerations as in every traditional lesson must be taken (Kenner and Jahn 2016):

- analysis of the initial conditions
- formulation of precise learning objectives
- appropriate choice and design of media and methods
- sequencing of the teaching-learning situations
- coherent assessment
- formative and summative evaluation of the course

Educational media used in the course should depend on the content objectives and not on the technical possibilities. For example, videos are very suitable for experiments, dynamic processes, principles of three-dimensional space or as a substitute for a field trip (Bates 2012). Adapting teaching to the medium will often lead to better results because that way students will learn more deeply and effectively.

Cooperation in the field of forestry education on a European level has advantages in that a much wider range of topics can be covered, the effort of content generation is distributed over more organizations and a larger target audience can be reached. However, the coordination effort is likely to increase.

Open education, like open source and open data, will play an increasingly important role in society. It certainly makes sense to follow this trend and to adapt learning programs if necessary.

5. Annexes

i)   Steps to introduce an LMS

1. Plan the training content and desired user interfaces in accordance with the target groups. 2.
2. Record the project objectives measurably in concrete figures so that it can be clearly monitored. Plan resources and responsibilities.
3. Integrate the system into an infrastructure.
4. Train your LMS administrators and develop content creation policies and guidelines. for content creation.
5. Assemble a team of communications and privacy experts, IT specialists, training managers, and representatives of the target learning groups.
6. Conduct a test phase with a representative user group.
7. Gather feedback and make adjustments.
8. Plan communications such as mailings and tutorials for go-live.
9. go-live
10. Continuously collect feedback, monitor goal achievement and make adjustments as necessary.

(Source: imc information multimedia communication AG)

ii)   Evaluating the quality of an online course

Find a checklist how to evaluate the learnability of a blended course here: (Commonwealth of Learning 2018): http://oasis.col.org/bitstream/handle/11599/2941/2018_COL_Blended-Course-Learnability-Evaluation-Checklist.pdf?sequence=1&isAllowed=y

From the same organization there is also a MOOC on how to develop and teach an online course: https://tell.colvee.org/course/view.php?id=4

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