Internet-based learning in higher forestry education

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Opportunities and limitations of online learning in forestry and natural resource management, with examples from Germany and South Africa.

Educational institutions today are confronted with the challenge of finding innovative ways to attract and retain students and to improve course quality and flexibility. They are also required to improve efficiency, increase graduates' success in the labour market and create new streams of revenue. In addition, with changing roles of forests worldwide, a newly graduated forester needs a variety of non-traditional skills. Internet-based or online learning, integrating communication tools, can open new avenues to provide for and facilitate existing forestry and natural resource management education worldwide (Brack, 2000).

This article focuses not only on some possibilities and advantages, but also on some limitations of integrating Internet-based learning into forestry curricula. It also provides a brief overview of the current state of Internet-based learning in Africa. Three examples – two from the University of Freiburg, Germany and one from Stellenbosch University, South Africa – illustrate how Internet-based learning, integrated into existing curricula, is being used to improve higher forestry education.

CHANGES IN FORESTRY EDUCATION IN THE NEW CENTURY

The past decade has heralded great advances in information and communication technology (ICT). It has seen the development of reliable computer networks and new forms of telecommunication, making vast amounts of knowledge readily accessible to a great number of people. The Internet, in particular, allows skilled users almost unlimited access to information and provides a platform for knowledge exchange. However, disparity in Internet accessibility – a "digital divide" – is evident between the northern and the southern hemispheres (Figure 1). Africa, for instance, has more than 10 percent of the world's population but constitutes well below 1 percent of the Internet community. In 2000, only one in 250 Africans were using or had access to the Internet, compared with one in two North Americans and Europeans (UNDP, 2001).

In the information society of the twenty-first century, additional skills are needed to deal with the information revolution and related overload. The Task Force on Higher Education and Society (2000) asserted that such skills needed to be in-

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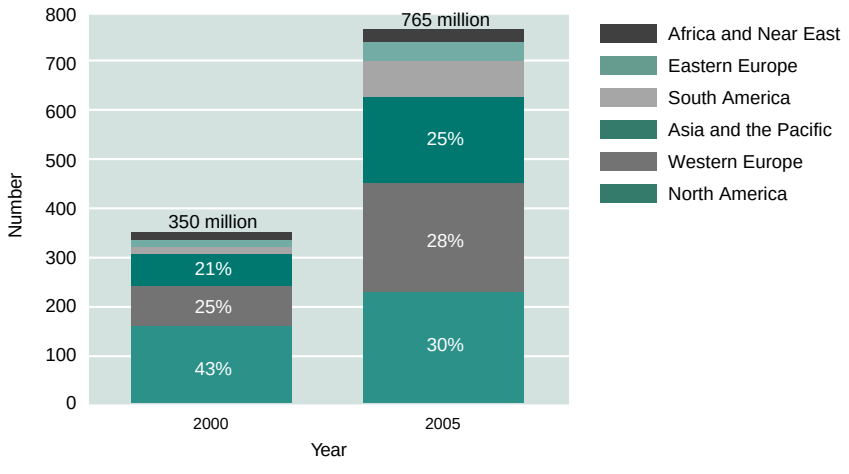
Expected global growth in use of Internet between 2000 and 2005 (millions of users)



Source: Computer Industry Almanac, Inc., 1997.

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cluded in core education and training requirements: "People need to have higher qualifications and to be capable of greater intellectual independence. They must be flexible and be able to continue learning well beyond the traditional age for schooling."

International trends in forestry, the latest developments in ICT, globalization and internationalization are forcing tertiary education institutions to adapt their curricula and rethink the skills and knowledge they want to impart to their students. Forestry education will have to equip today's graduates with an understanding of forests and natural resources, of the complex environment, of social and economic demands on land and natural resources and of human attempts to manage them. Forestry graduates must be internationally strategic thinkers with a variety of skills. Lifelong learning and on-the-job training are therefore crucial. In this context, ICT offers flexibility and freedom from scheduling and spatial constraints.

DEVELOPMENT OF E-LEARNING

The generic term "e-learning" describes any form of electronically supported learning, ranging from the use of learning software on a personal computer to the use of an intranet or the Internet for interaction within networks ("Web-based training"). Forms of e-learning vary in the manner of data submission, potential of interaction, flexibility of learning media and underlying didactics. The different electronic learning approaches all have in common the use of multimedia, combining text, sound, graphics and/or video on a computer platform.

The concept of e-learning emerged during the 1980s with relatively simple learning and game software to support basic education. It then moved towards more complex learning programs meeting individual learning requirements and offering virtual environments for self-study. The expansion of the Internet's capabilities, including interaction and communication via e-mail, chat and/or video streaming, allows real-time exchange of information among learners and dialogue with tutors. Thus e-learning no longer lacks a component of human interaction.

Virtual learning, virtual universities and virtual realities are catchwords of an industry in which new trends emerge monthly. With increasing experience and evaluation, however, the technology-driven euphoria has subsided in recent years. Criticisms of e-learning have included the low didactic quality of e-learning products, the high development costs related to small target groups (common in forestry education), trainers' and users' gaps in media and computer skills and the paucity or lack of personal interaction. A need has been recognized to focus on didactic concepts in e-learning initiatives. This has led to so-called hybrid or blended learning, a combination of computer-based learning and traditional face-to-face education. These methods too have been subject to criticism.

Today the question is not whether e-learning can be used effectively to support the human learning process and to improve the quality of education, but rather under which conditions and through which didactic approaches improved results can be achieved. Does it make sense to implement computer-supported learning in a successful university environment where face-to-face interaction, group work, practical training and seminars can probably be more effective? Should the computer replace or supplement lecturers, textbooks or notes?

INTERNET-BASED LEARNING AND THE LEARNING PROCESS

From the viewpoint of the learning process, Internet-based learning can enhance students' communication and computer skills, media competency and self-motivation. It can support the individual needs of different learners and even allow students to work in virtual realities.

The interactive components are particularly important, enabling tutors to support the individual students' learning process and to intervene actively in their progress (Kassop, 2003).

COMBINING ONLINE AND FACE-TO-FACE LEARNING

Internet-based learning can be incorporated into existing curricula, for education of students and further training of professional foresters, by combining online with face-to-face learning in various ways.

For resident students, the Internet can be used to provide online course material for self-study and for preparation or repetition of traditionally presented material. This supports different learning styles of individual students. Discussion groups or e-mail contact with the tutor can provide an additional component to the self-study process of each student.

Face-to-face teaching can be complemented with Internet-based learning, making it possible, for example, to offer a synchronized forestry course at two remote locations. Common course material can be offered online, and interaction between the students at both locations is assisted through e-mail, chat or discussion board.

Pure distance courses can be suitable for students living in remote areas who cannot afford to travel to an education and training institution. Distance courses can also be offered as a further training tool for foresters spread out countrywide for specific further qualification.

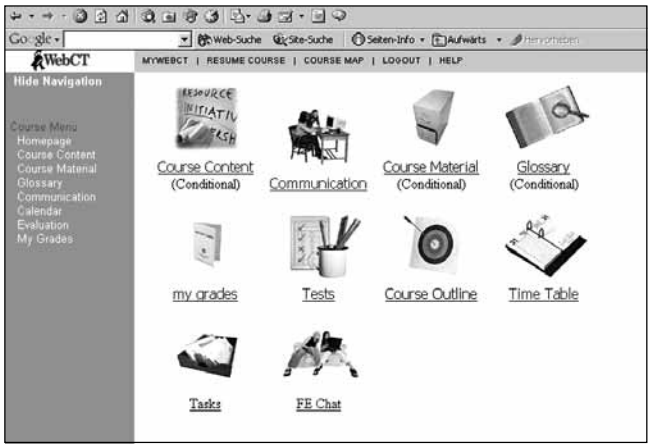
ONLINE LEARNING TOOLS

Effective Internet-based courses require a set of online tools. A learning platform is needed, which integrates the course syllabi and multimedia course content as well as communication, document-sharing, self-test and examination tools (Figure 2). Another core function of a learning platform is an administration system, which allows lecturers to organize their online course, offering file transfer, question databases or student tracking (Figure 3). During the past few years a variety of so-called learning or content management systems have been developed which offer an interface for online courses. Commercial products include WebCT and Blackboard, but a variety of open-source systems have also been developed, for instance, ILIAS (Integrated Learning Information and Working Cooperation System) at the University of Cologne, Germany, or OLS (Open Learning System) at the University of Natal, South Africa.

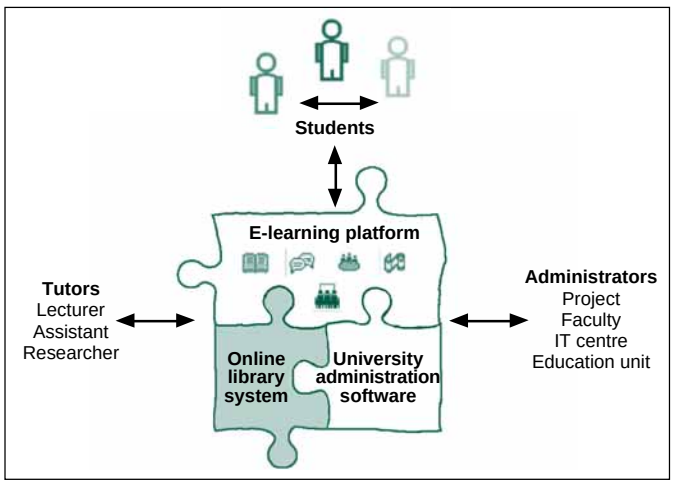
These content management systems allow lecturers to develop online courses without specific previous ICT experience or programming skills. There are, however, also certain risks involved, in that it is possible for an instructor to upload a few documents, activate the discussion board and call it an online course. To be used effectively, these concepts require sophisticated developmental efforts and well thought-out didactic systems. Virtual learning should do more than just offer learning materials as in traditional textbooks (Schulmeister, 1997).

INTERNET-BASED LEARNING IN FORESTRY

Apart from the use of the Internet as an information and communication network, Internet-based learning has not yet had an important role in higher forestry education. A number of universities and institutions, particularly in North America



2 Example of a WebCT learning platform integrating the course content and communication, document-sharing and testing tools



3 Integrating content management systems in university curricula

and Australia, have used Web pages as teaching materials in higher forestry education and training (e.g. compendia of links or literature), but these efforts cannot really be termed Internet-based courses. The dearth of such courses might be due to unjustifiably high development costs, small student target groups, or the apprehension that computer-supported learning only trains theorists in a very practice-oriented field of science.

Two examples from the University of Freiburg, Germany

One of the few examples of Internet-based learning today in the field of forestry is Forest Ecology Online, a set of Internet-based online courses initially developed at the Institute of Soil Science and Forest Nutrition, Faculty of Forest and Environmental Sciences, University of Freiburg, Germany.

To respond to changing career paths of graduates, a major curriculum revision was carried out in 1994 at Freiburg. One of the core changes was a reduction in the number of hours allocated to the basic sciences in the initial years of study (Lewark, 1997, 2002). However, it became evident that first-year students had different levels of basic knowledge. To solve this dilemma, Internet-based learning modules for independent study have been under development since 2000 to complement traditional courses. Courses within Forest Ecology Online range from soil science and forest botany to biometrics. Forest Ecology Online uses the open-source content management system ILIAS. Course units are based on HTML, using graphics, complex animations and interactive exercises. Interested readers can request guest access online from the institution's Web page (www.ffu.uni-freiburg.de/bodenkunde/english_index.htm).

Another example is Forest Ergonomics Online, a blended-learning course developed within a joint research and development project of the University of Stellenbosch, South Africa and the University of Freiburg (Figure 4). This two-week course was offered in July 2003 to forestry students at Freiburg and from Eastern European faculties. The Web-based course material was combined with a half-day face-to-face introduction and a field trip at Freiburg; a "virtual" field trip enabled the Eastern European students to do time study measurements without actually visiting the forest. Discussion groups and regular chat sessions contributed to a strong interactive component, facilitating communication between resident students and those accessing the course from Eastern European countries. This remained the principal strength of the course. Students were required to work independently through eight core modules and recommended additional reading. They were encouraged to use a self-test function to control and monitor their progress. Students were also required to complete assignments based on their self-study, and these assignments were discussed and analysed during subsequent chat sessions.

AN AFRICAN PERSPECTIVE

Internet-based training may be a useful tool for making better use of limited forestry training capacity, facilities and resources available in some African countries, and for promoting regional or subregional approaches to forestry education. The introduction of recently developed Internet-based courses could provide a crucial incentive for revising outdated curricula.

Distance education using television, radio or postal services to reach students in remote areas is not new and is already well established in developing countries (Perraton, 2000). Five of the ten largest distance-education programmes in the world are based in developing countries. The University of South Africa (UNISA) is the world's oldest distance-learning university; among its graduates are Nelson Mandela and Robert Mugabe.

Yet in most African countries distance education via the Internet is still restricted by unavailability of computer hardware and by infrastructure limitations such as restricted and inadequate bandwidth, unreliable telephone lines and monopolized telecommunication companies (Fillip, 2000). Costs of telecommunication in Africa are inordinately high relative to average per capita income.

Nevertheless, African governments and educators continue to express the need for the development of e-learning infrastructure and skills, and see opportunities to close the knowledge gap between developed and developing countries (Ouane, 2000). Recent improvements of the continent's ICT infrastructure are evident, although limited and restricted to certain countries.

Internet-based learning at the Department of Forest Science, Stellenbosch University, South Africa

Internet-based courses on forest ergonomics and forest engineering, developed over the past two years within a joint research and development project of the University of Stellenbosch, South Africa and the University of Freiburg, Germany, now form part of the curriculum at Stellenbosch (see www.sun.ac.za/forestry/onlinelearning/learning.htm).

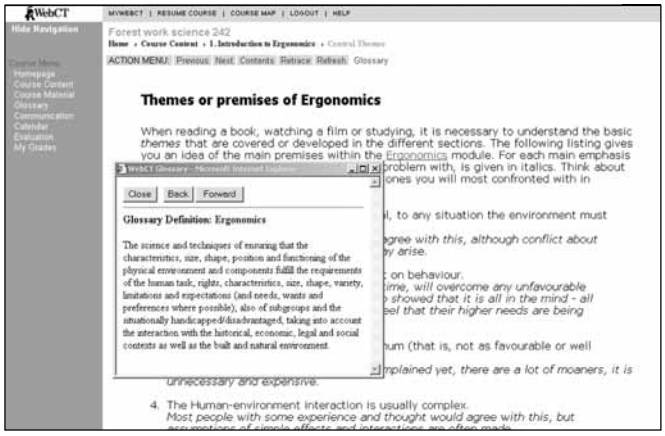
The self-study sections were designed in modular form to allow for transfer of course material from one learning platform to another and also for delivery via CD-ROM if necessary. To reduce download times and obviate the need for students to install additional software on their computers, course materials were designed using HTML and Flash animations. The first test runs of the courses used the content management system WebCT, which features the required communication and

interaction tools such as chat, discussion board and document sharing.

The course content addressed basic topics necessary for successful forest engineering operations, including productivity factors; costing, planning and management of harvesting operations; timber specifications; and equipment maintenance.

This forest engineering course was jointly offered on a trial basis between Stellenbosch University and the Forestry Department at PE Technikon, Port Elizabeth, South Africa, to demonstrate the potential of pooling resources of universities and technikons (institutions for technological higher education). It was expected that the joint course could support learning by students with different backgrounds and provide an interface between the National Diploma course, which typically has a practical orientation, and the scientific B.Sc. curriculum in forest sciences. Within the curriculum of each institution, the course combined face-to-face instruction, practical training and Internet-based learning. A strict time schedule synchronized contact sessions between the two institutions to accommodate chat, discussions, self-tests and electronic assignments delivered via WebCT.

Although both groups covered the same course material, the responsible lecturers evaluated their particular students' tasks, assignments and tests independently. In addition, the final examinations were compiled and administered separately to safeguard the educational integrity of the two institutions.



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Online forest ergonomics course – example of a content page

ISSUES AND LIMITATIONS

The following are some observations from the authors' experiences.

Developing computer-based learning material and courses should always be a team effort, as it requires comprehensive experience of didactics, informatics, course content and project management. Even with the aid of a content management system, an Internet-based course is difficult for a forestry lecturer to run alone. If the didactic approach of a course is not appropriate, students' curiosity and enthusiasm will immediately start to wane and will eventually be lost altogether, causing general frustration with computer-supported learning.

Students are often not used to self-organized learning. This was observed particularly during the courses implemented in South Africa. Many students still prefer receptive teaching methods (e.g. lectures), which cannot succeed in an Internet-based learning environment. Therefore lecturers should use the "new" media, computer and Internet, to motivate students towards responsible independent learning. The acquisition of communication and information technology skills is an added benefit of e-learning and can serve as a key qualification for graduates preparing for their future careers. The acquisition of these skills is equally beneficial for lecturers and tutors, who often begin with little experience in this area.

E-learning does not save time and money. Significant amounts of both are necessary to create, maintain and update a motivating online course, rich in relevant content. During the course, students expect a lecturer to be available online daily and even around the clock. A resulting benefit is intensive interaction between students and lecturer.

Course content should be designed in such a way as to facilitate transfer from one content management system to another. There is currently no standard for e-learning content management systems. It is hoped, however, that this will change within the next two to three years.

Sharing of Internet-based courses among institutions can help overcome capacity limitations and, in particular, enable developing countries to participate in the knowledge and information society. However, students of different social and cultural background and with different levels of basic knowledge may require different teaching methods, and course content needs to be adapted to facilitate different students' learning processes. Content also needs to be adapted to take into account variations in prevailing ecological and socio-economic conditions in students' countries. For example, broadcasting videotaped footage of lecturers from the United States to students and classes in East Africa has had poor results (Amutabi and Oketch, 2003).

On the other hand, the Internet may be the means of realizing a forestry lecturer's dream. Imagine being able to dis-

cuss, for example, different timber harvesting systems used internationally with a group of motivated students from different regions of the globe in one virtual classroom. ◆

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