Timber Engineering Online

Dr Sabine Nolte
Project Coordinator / Research Fellow
Centre for Timber Engineering, Napier University
Edinburgh, UK

Dr Dan Ridley-Ellis
Senior Research Engineer
Centre for Timber Engineering, Napier University
Edinburgh, UK

Summary

This paper highlights some of the opportunities, challenges and issues encountered in creating online teaching and learning materials for timber engineering that provide an experience equivalent to face-to-face teaching for the student. It introduces the Timber Engineering Online project at Napier University's Centre for Timber Engineering in Edinburgh, which aims to establish best-practice for flexible online education for the forest and timber industries with respect to learner needs as well as those of the education providers. The project is part-funded under the European Social Fund Scottish Objective 3 Programme 2000-2006, which aims to improve economic growth and create jobs in Scotland.

1. Introduction

Specific education in timber engineering started at Napier University in Edinburgh in 2004, with the introduction of a new Bachelor's programme in 'Civil and Timber Engineering' and two new Master's programmes in 'Timber Engineering' and 'Timber Industry Management'. This activity was sparked by the establishment of the Centre for Timber Engineering, in 2003, with funding from industry and Scottish Enterprise. The Centre was created because of a recognised lack of timber engineering knowledge among graduates and professionals in the UK, where timber forms about only one percent of a traditional civil engineering degree syllabus (The Structural Engineer, 2003).

The forest and timber industries form an important part of the Scottish Economy, particularly in rural areas, and forest outputs are set to rise over the next fifteen years. Timber frame construction is gaining market share within the UK and the expanding timber industries are facing problems in recruiting staff with sufficient timber knowledge and skills. Much of the specialist expertise is held by an ageing workforce and organisations struggle to train younger staff while maintaining competitive productivity. The urgent need for timber engineering education to meet the current needs and capitalise on future opportunities is well recognised, but the capacity to deliver this timber engineering education in the necessary volume and delivery mode was missing in the UK which stimulated the setting up of the Timber Engineering Online (TEO) project.

2. The Educational Needs of the Forest and Timber Industries

As part of the TEO project, the educational needs of the forest and timber industries were assessed by online survey (Ridley-Ellis and Nolte, 2006). The purpose of the research was to gain information about specific curriculum and skills needs, to measure preferences for delivery mode and to assess readiness for take-up of online learning.

About half of the employers and a third of the employees who responded to the survey expressed an interest in additional education and training in timber engineering. It has been proposed that some

of the workforce skills issues for the industry are due to employers undervaluing staff development in general causing, in turn, employees to view education and training as something incidental to their career development (Scottish Forest Industries Cluster, 2006). Predictably, demand was higher from those in professional roles than those in technical and manual roles.

While there was evidence of demand for education in the form of academic programmes, the majority (65%) of those interested in additional education and training stated a preference for short courses. Importantly, the survey results confirmed the remit of the TEO project indicating that, for short courses, demand was much higher for flexible online delivery (60%) than for traditional attendance-based delivery (25%). For degree programmes, blends of online and face to face delivery, and online and paper distance learning were the preferred options. The survey showed little demand for traditional attendance only courses from within the forest and timber industries.

For academic programmes it must be borne in mind that the majority of respondents (70%) said they would like to study no more than 10 hours per week, indicating that study would have to compete with the demands of employment and other commitments.

Training was seen to be needed on a range of educational levels with employers particularly stressing a need for training at technician and operative level. Overall, respondents expressed interest in a wide range of subjects covering not just timber engineering but also forestry related subjects, sustainability, management, marketing and computer skills.

The provision of education and training for the forest and timber industries has to be tailored to these requirements. Flexibility of access and rate of learning is the key in a sector where organisations are often located away from the large city centres and where size of company and business pressures make it difficult for people to travel to time-tabled educational events.

3. Readiness for Uptake of Online Learning

As the survey was promoted and conducted online, its results are distorted, nevertheless, the findings show a genuine readiness for the forest and timber industries to embrace the online education demanded.

Almost all employee respondents considered themselves to have intermediate or advanced computer skills (95%) and internet skills (90%) with around 85% stating that they would feel very comfortable communicating online. Nevertheless, it is important in online learning that there is always an option for personal conversation with the instructor, for example, by telephone.

Ease of access to the internet for studying does not seem to be a problem for most potential students (90%) and respondents indicated that they would be able to access online courses at home (80%) and in the office (75%). Three quarters of the employee respondents said they had access to an ‘always on’ internet connection (like broadband), which is consistent with the UK national average. There is, however, still a wide variety in internet connection speed and the users with access only to 56kbps or slower connections (20%) must be considered when preparing online learning materials, whether by ensuring low bandwidth demand, by providing alternative material that is easy to download, or by linking online content to material distributed by post on disk.

4. Designing Timber Engineering Courses for Online Delivery

Online courses at Napier University are published using the Virtual Learning Environment (VLE) WebCT Vista 4.0. For the TEO project online course materials are being designed to improve the learning experience for both on-campus and off-campus students and will be a significant improvement over previous paper only learning materials. The project will run until January 2006, concluding with market evaluation of online modules from the two MSc courses.

Technology enabled learning allows more interaction between the student and the content, which for engineering can mean improved visualisation of complex systems and simulations of activities too expensive or dangerous to create in the laboratory. Interactive calculations reassure students they are working correctly and can reduce pressure on teaching staff to field questions. Furthermore, they can be sensibly randomised allowing students to practice on fresh problems each time they access the material.

While distance learning using paper materials normally means individual study plus an examination or coursework, distance learning using online environments can create more closely-knit communities that permit more effective student-centred learning. Some learners even prefer to communicate via e-mail and participate better online than in an on-campus class environment (Berge and Collins, 1995). The key to effective teaching lies in proper management of both the learning space and the student interaction. While the content and learning outcomes can remain essentially the same in migration from face to face to online learning the character of communication must be changed more radically. Simple VLE tools like "Who is Online", "Chat" and "Whiteboard" can be used to create engaging interactive online sessions and facilitate easy communication among the students and with the course instructor, e.g. for sharing ideas and getting feedback. These standard tools are not always fully suitable for engineering teaching, but the VLE can also be enhanced with additional tools similar to those used in collaborative design in industry, to provide a more versatile, varied, supportive and rewarding environment.

It is often advocated that online students use a separate online course to those students undertaking the same module in blended learning. For small classes, this is highly demanding on teacher time requiring additional effort in both development and delivery of the education. Needs of academic staff are often overlooked in statements of best practice, but what is really needed is a compromise between what is best for the student and what is best for the teacher. Thoughtful design of learning activities, module templates and student briefs can alleviate problems of two groups of students using the same online learning space. Indeed, discussion and group-work activities can be enhanced by mixing both groups of students giving a greater range of backgrounds and a larger class size. In essence, students need always to be clear about what is expected of them individually and the educational experience must be equivalent for both groups.

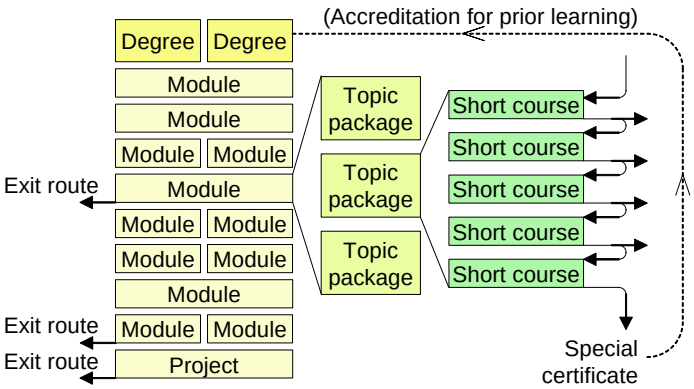

Fig 1 Potential structure of flexible education

Modules on engineering courses cover a range from highly mathematical subjects, to highly text based subjects to subjects requiring large amounts of group activity. Careful instructional design is necessary from the outset to ensure that learning activities are appropriate for the desired learning outcomes. Examples of activities include interactive example problems, collaborative design projects, virtual laboratory exercises, group discussions, case studies with role play, research tasks, and use of distributed specialist software. In addition, VLE tools can be used to encourage more effective learning through enhanced feedback, self-assessment and reflection tools. Nevertheless, where subjects require the reading of large amounts of text, the advantages of using printed materials linked to online resources should not be overlooked.

Since the creation of online learning materials is time consuming and costly, learning objects should be reusable in different contexts. This presents opportunities for efficiencies not possible with face to face teaching by designing portions of academic modules to be accessible also as commercial short courses (fig.1). In some cases, these short courses can be suitable for bearing academic credit, something that was seen to be attractive in the results of the survey. This approach presents opportunities for universities and colleges to generate income from their development investment and, potentially, creates a new route for learners into full academic programmes.

5. Conclusions

Recent survey results have shown that there is both demand and readiness for online learning within the Scottish forest and timber industries. However, education and training providers need to recognise that full academic programmes may be too demanding on time for many potential learners and a modular catalogue of short courses may be more appropriate. In this case, providers should consider how time spent studying can be recognised formally within the academic system, and should investigate ways of opening up parts of their programmes to students who wish only to study particular topics.

Online learning materials have to be designed carefully and the learner skills and preferences have to be taken into account from the outset, as do the needs of the instructors. Even so, the potential of technology enabled learning to enhance both distance and face to face learning is substantial, and opportunities exist for providers to offset higher development costs by commercialising parts of their academic programmes. Courses offered to the industry should not just concentrate on providing subject knowledge, but should also incorporate transferable information technology, communication and management skills relevant to the industry.

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6. References

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