# Developing and running a web-based programme in Pharmaceutical Science – new roles, new strategies?

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*In 2003 the University of Umeå, Sweden, started a web-based Pharmaceutical Science programme. The programme was developed in response to the need for qualified pharmacists in rural, sparsely populated areas. A web-based programme offers many possibilities such as increased access to higher education for citizens living in remote areas, but at the same time the development and delivery of such a programme are associated with difficulties, such as the creation of a favourable online environment and the introduction of online teaching into a 'traditional' university setting.*

## 1. Introduction

The concept of "Lifelong learning" has created an increased demand for flexible education for adults and a growing number of universities and schools are adopting distance modes of delivery to satisfy this need. Particularly in the field of web-based courses for professional education and continuing education, the demand for further development is substantial. In Sweden there is an acute scarcity of certain professions in rural areas: in particular teachers, health care professionals, and pharmacists. The Pharmaceutical Science programme was initiated in response to a request by the Swedish pharmacy chain *Apoteket*, who were having difficulty in recruiting pharmacists to work in the northern and more remote areas of Sweden. Even though the pharmacy chain *Apoteket* is the largest employer of pharmacists, access to competent, well-educated staff also creates favourable conditions and increase the competitiveness of biotechnology enterprises in the region. In order to educate learners already living and working in more remote areas, it was necessary to create a web-based, distance programme enabling students to study without having to disrupt their lives by moving to a university campus.

Web-based distance education has many advantages to offer the adult learner such as flexibility in time and space and the provision of access to higher education for new groups of students. However, distance education also has several shortcomings. Dropout rates are often high and distance may be expressed not only as a geographical but also a psychological barrier: not meeting tutors or peer learners may create feelings of isolation and alienation.

Research has shown that collaborative learning may be one method of bridging the isolation of the distance learner. Several studies have shown that outcomes of web-based courses improve when courses are structured in a way that supports the growth of a learning community (Benbunan-Fich, R & Hiltz, S.R., 2003). Collaborative learning and active participation online are found to be strong mediators of the outcomes of online courses. A structure of local and online tutors was therefore implemented to provide students on the Pharmaceutical Science programme with the necessary support to improve learning and reduce attrition.

In Sweden an increasing number of local learning centres are evolving as the foci of education networks for both higher and further education. Roos (2000) and Rennie (2003) have demonstrated the pedagogical and organisational advantages offered by local learning centres and the importance of local learning centres in recruiting "non-

traditional" learners unaccustomed to academic study and unfamiliar with the technology involved in web-based learning. An initial survey into the category of learners expected to study on a web-based Pharmaceutical Science Programme indicated that they would most probably be older than the average student, rooted in their present residential area and come from a non-academic background. It was therefore decided at an early stage that for students not choosing to study independently, local tutors and learning centres should be utilised to facilitate the creation of a learning community. In the case of the independent students online tutors were provided to support students and promote a sense of community.

Learning environments for professional education must support the achievement of both generic skills, such as communication, IT-literacy, collaboration, critical thinking and problem solving and also that of discipline-specific skills. When taking part in web-based education, students also develop competency in areas such as computer literacy, Internet use and other software used in the programme. Skills such as the ability to access online information, electronic prescriptions and Internet communication with customers living far from the nearest pharmacy are becoming increasingly important in working life in Sweden. For students on the Pharmaceutical Science programme, professional competency is facilitated by workplace learning placements in the field and by contact with local tutors, who are qualified pharmacists.

The purpose of this paper is to describe the development, production and implementation of a web-based programme in Pharmaceutical Science and to discuss the possibilities offered and pitfalls to be avoided in this type of web-based education.

## 2. Description of the programme

Taking the above mentioned factors into consideration, it became obvious that a web-based, distance programme using a support structure of online and local tutors would be the most suitable solution for the Pharmaceutical Science programme.

Accordingly, the programme is almost entirely web-based. Students can choose to participate in local study groups centred at learning centres or as individual distance students not linked to any particular locality. Independent of to which category the student belongs, digital course materials are delivered using a learning management system[1]. Teacher-student communication and student-student communication are also enabled by means of the LMS as is the delivery of lectures, seminars and tutorials. All study groups including those studying independently are assigned an experienced pharmacist as tutor. The students also have access to teachers and experts at the university throughout the programme using ICT technology (web cameras[2], chat rooms, discussion forums etc.). No detailed previous knowledge of computer use is necessary. Instruction in the necessary technology and software is provided during the introductory course on campus.

Students participating in local study groups gather once or twice per week for group discussions or question sessions at the local study centres. In addition there are meetings at the local centres for certain obligatory elements of the course. Students studying independently meet their tutor and have the opportunity to ask questions via Internet using both text messaging and web cameras. There are also two to four meetings per term at the university in Umeå for laboratory training, practical work and examination.

The programme includes ten weeks practical experience at a pharmacy, with the assistance of an experienced pharmacist or dispensing chemist as tutor. There is also a final thesis, carried out

[1] A commercial LMS, Ping Pong developed in Sweden by Partitur is used. http://pingpong.se/index.en.html

[2] The communications software Marratech is used http://www.marratech.com/

at a pharmacy, hospital, research institute or in the pharmaceutical industry. The programme leads to a degree in Pharmaceutical Science.

## 3. Development of the programme

Umeå University is one of Sweden's leading universities with regard to distance education and the implementation of ICT in education, and has a well established technical infrastructure for the delivery of net-based education. However, the development of the Pharmaceutical Science Programme required considerable planning since it involves staff from different faculties and departments within the university, and for the majority of teaching staff was a new way of working.

Designing a net-based programme is a complex process involving many separate activities:

- in-service training for teaching staff involved in the production and implementation of the programme
- the development and production of web-based materials
- technical support for both staff and students during the delivery of the programme.
- maintenance and revision of course modules

Responsibility for the co-ordination of the development of the programme was assigned to the Centre for Educational Technology, a joint resource for the university in the implementation of ICT. Evaluation and revision of the programme and the courses involved has been carried out by CUT and later by the Centre for Teaching and Learning at Umeå University.

### 3.1 Staff development

An in-service training programme was offered to all staff involved in the programme, thirty teaching staff in all. This induction programme consisted of three phases: a workshop on the background and development of the Pharmaceutical Science Programme, a series of seminars on, among other things, online collaboration, video streaming, simulation and visualisation and legal questions concerning copyright, and finally practical training in the technology to be used; the LMS Ping Pong and Marratech.

After the initial development phase, continual competency development in the pedagogical use of ICT is provided for staff by the Centre for Teaching & Learning.

### 3.2 Development of materials

In order to develop the courses to be included in the programme and produce web-based modules to be delivered over a period of three years, a large-scale development project was required, where content experts, personnel working within the pharmaceutical industry, pharmacists, educational technologists, web designers and technicians all acted together as a team.

Subject experts and teachers were appointed by the Director of Studies to guarantee the qualitative level of course content. They defined the content of the course and also suggested a structure. A storyboard and script were then produced in collaboration with educational technologists, which was used by web technicians and designers in the production of course modules.

The web modules contain not only text and illustrations but also interactive exercises, tests, streaming video, visualisations and simulations of processes. Great care has been taken to ensure best possible usability and to adapt the material both to the subject matter and students studying on the programme.

Generally speaking, there are a number of different models for the development of net-based education, for example a 'bottom-up' perspective where enthusiasts develop courses indivudually, a 'negotiated' model where teaching staff co-operate with technical expertise and

a ‘top-down’ model where centralised decisions and policy control the implementation of educational technology. In the case of the net-based Pharmaceutical Science course a top-down model was adopted. This model has both advantages and disadvantages. One significant advantage with centrally co-ordinated development models is that the experience gained is retained within the development organisation, in this case CUT, and can more easily be distributed to other institutions benefiting the university as a whole. In the case of ‘bottom-up’ development where development projects are run by a few enthusiasts, distribution of knowledge and experience gained can be problematical. Further, the technical expertise and pedagogical experience of online education necessary for the development of high quality net-based materials, is frequently lacking within the individual departments.

These advantages must be weighed against the disadvantages experienced by teaching staff and content developers, which is discussed in section 4, results.

### 3.3 Technical support

Technical support was provided for staff both prior to and during delivery of the programme. Students enrolled on the programme received instruction in the technology and software to be used during their introductory course on campus. For students studying at learning centres it is also possible to receive support from technical staff at the learning centre. Telephone support is also available for all students and staff.

### 3.4 Maintenance and revision of course materials

The modules produced were tested by students and teachers before implementation in the programme. Further, a schema for the continual evaluation and revision of course modules during the lifetime of the programme was devised and implemented.

## 4. Results

### 4.1 Staff development

When interviewed as part of the evaluation carried out by the Centre for Regional Science, CERUM (Nordström & Englund, 2004) the teaching staff of the Pharmaceutical Science Programme indicated that despite having little previous experience of online teaching, few had participated in the series of seminars intended to introduce them to the methods and pedagogy of net-based learning. The most common reasons given for non-attendance were time constraints and the fact that the seminars were too general and not sufficiently “hands-on” to be of interest. Finding time for competence development is a common problem for university lecturers where research, teaching and administrative duties all have to be balanced against the need to develop new skills and competencies. It is therefore perhaps not surprising that staff choose only to attend seminars considered to be essential. This should be compared to the more practical training provided in the use of ICT technology, where participation was almost 100%.

For the sake of coherence, it is essential that teaching staff on the programme have a common attitude to teaching and learning. More time needs to be devoted to developing not only technical skills but also attitudes to online learning. It is obvious from the evaluation results that the provision of seminars is not the best way of achieving this.

On-going, peer supported learning about effective distance teaching practice is viewed by many as being an effective solution to staff development, providing collegial support for teachers venturing into online teaching for the first time (Burge & Rourke, 1998). Team teaching or even more informally the ‘vicarious experience’ of staff watching their colleagues who are teaching online could also be a solution. Conversations and discussions concerning online pedagogy and practice in an informal setting can be a more successful method in changing attitudes and motivating staff who are more used to traditional face-to-face teaching than seminars and formal in-service training sessions.

Many of the teachers involved expressed an interest in having a 'mentor' or more experienced colleague to provide support and discuss problems with in the initial phase of their online teaching. Learning "on the job" was seen as being preferable to attending seminars prior to beginning teaching. How this should be organised and how the mentors should be compensated for their time is a problem yet to be solved.

A positive spin-off effect from the development of the net-based Pharmaceutical Programme has been the increased willingness of staff to use ICT in other areas. When interviewed, the majority of staff expressed a positive attitude to using ICT in the future either as a complement to more traditional methods of delivery in campus-based courses or in stand-alone short courses for industry. An increase in flexibility not only for the student but also for staff was frequently stated as a positive attribute. The pedagogical possibilities provided by simulations and animations to illustrate complicated processes, and the possibility of reaching new student groups were also considered positive aspects of net-based learning.

**4.2 Development of materials**

As previously mentioned, the implementation of a top-down system for materials production is not without disadvantages. Most of the staff involved were happy to work as members of a production team. However, when interviewed some staff were critical of the central control exerted. Resentment over not being able to edit material themselves, having to write a script and then hand it over to others for production and the necessity of following a time schedule and holding deadlines were all expressed as negative factors in production.

Distance or net-based education challenges current ideas of power and control in higher education. Traditionally, teaching staff have control over the content of the knowledge they distribute, but in net-based education it is necessary to collaborate with other staff such as educational technologists and technicians and materials become more open to scrutiny. This loss of control may help to explain why some staff reacted in a negative fashion to working as a team member in production.

Initially, not all teaching staff were aware of what is involved in planning and implementing a web-based course. At worst the attitude was that it is just a question of re-packaging existing materials or eventually recording lectures to be delivered digitally. The necessity of adapting material for net-based delivery and taking the needs of the student populations into consideration were not always obvious to teaching staff, making co-operation with more experienced educational technologists essential. Inexperience in estimating the time needed to develop and deliver material for online delivery also caused problems in keeping time schedules and holding deadlines for the production of material. This was a problem for many staff members but also for the technical production team.

The successful development and implementation of a net-based education depends on the integration of a variety of activities that all need to work together. This indicates the necessity of adopting a top-down, centrally steered system. A management structure that controls and co-ordinates the various activities or sub-systems is needed. In the case of the Pharmaceutical Science Programme this role is taken by the planning committee, consisting of representatives from the various university departments involved, the pharmacy chain *Apoteket*, learning centres, students and pharmacists.

**4.3 Technical support**

The technology used offers increased possibilities but also places heavy demands on the users. Technical support is a crucial element in the success of online teaching and learning; it is a well-researched fact that if the technology does not function from the start and sufficient support is not available students and staff soon lose motivation. Results indicate (Nordström & Englund, 2004) that on the whole technical support has functioned well and that staff perceive

the existence of a well-functioning technical infrastructure as a positive factor in the delivery of the programme.

### 4.4 Maintenance and revision of course materials

Despite the existence of the planning committee, the roles and responsibilities of the parties involved were not clear initially. This had a negative effect on the quality control of course material, where it was unclear where the final responsibility for the overall quality of content lay. This is especially important in a programme where materials are produced by many different authors but the programme must form a cohesive whole, with uniform quality in both content and delivery. This problem has now been alleviated by the documentation of roles and responsibilities for teaching staff, tutors, production staff, administration and management.

The creation of routines for the evaluation and revision of course modules is also essential, as is the question of financing not only during the development phase but also throughout the envisioned lifetime of the programme.

## 5. Conclusions

The introduction of online teaching changes roles, demands new skills and often new attitudes to teaching. It is frequently at odds with established norms for measuring workload or allocating finance, and when programmes are spread across several faculties and departments it can bring to light differing cultures and practices.

Developing and implementing a net-based programme is not just a question of developing course material; a technical infrastructure, support structure, in-service training for staff and routines for maintenance and delivery are also needed.

In common with MacDonald & Thompson (2005) we would like to emphasise that the successful development and implementation of high-quality net-based programmes and courses requires that they are part of a systematic integration of technology into the education system of the university. Online teaching needs be supported through systematic and well-organised faculty initiatives.

In conclusion, there are certainly pitfalls to be avoided in developing and implementing net-based education, but these are far outweighed by the many new possibilities offered.

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