

Web-based PBL scenarios

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Abstract

Introduction

In 1986, the Faculty of Health Sciences (FHS) at Linköping University, Sweden, implemented problem-based learning (PBL) as the main educational philosophy for all undergraduate study programmes. In 2001 web-based PBL scenarios were introduced by the EDIT project (Educational Development using Information Technology). The main aim of this project was to use information and communication technology (ICT) and multimedia in PBL scenarios to improve students' learning. Another objective was to get students used to handling computers and accessing information from the Internet, thereby preparing them for the use of ICT.

The role of the scenario in PBL

A PBL scenario should motivate students by presenting a problem in a realistic context relevant to their future profession. The scenario should also challenge students' prior knowledge and raise questions from which learning needs can be formulated (Dolmans et al. 1997). Selection of problems and the order in which they are presented are also important factors in a PBL curriculum. Scenarios in a medical or health care programme should reflect common health problems and be chosen in such a way that they are examples of important concepts relating to the goals of a particular semester or of the whole programme. The qualities of the scenarios are likely to influence the outcome of students' learning and the learning process in PBL (Schmidt 2000; Margetson 1998, Abrandt-Dahlgren, Öberg 2001).

In the Linköping PBL curricula, subjects are integrated into themes covering the main aspects of the future professions. Within such themes, reality-based situations or problems are selected as scenarios. The scenarios are processed in tutorial groups consisting of 6-9 students together with a tutor. Previously, the scenarios have been presented in the form of papers.

The EDIT system

A web-based database application for the production and presentation of PBL scenarios with multimedia was constructed by the University's IT department. The system has a user-friendly interface with a simple design that can include different multimedia formats. The scenario is allowed to develop gradually without exposing all the information at once. EDIT is presented on a password-protected intranet. An easy-to-use system for the administration of users, scenarios and scenario components, and a simple evaluation system for feedback to teachers and scenario constructors and administrators have been developed.

Group room equipment

The EDIT group rooms are equipped with a computer (cordless mouse and keyboard to allow all students equal group participation), a projector, a screen and a whiteboard. The projected screen image, enlarged on a whiteboard, enables the group to focus on the same part of the scenario at the same time. Students document learning issues and questions continuously. The MS Word documents produced during the tutorial session can be sent by e-mail to the group participants.

Organisation for scenario construction

The EDIT-project has a part-time project leader, a full time co-ordinator, and a part time webmaster. The scenario constructors (teachers and clinicians) are supported by the small production unit in the process of transforming scenarios on paper or constructing new web-based scenarios. The production unit can help out with video production, pictures and other multimedia presentation forms. Furthermore, a faculty network, consisting of teachers from diagnostic specialities such as radiology, clinical chemistry, pathology and microbiology, produce digital images such as X-Ray images and microscopical images. A database of multimedia components has been created, which facilitates the re-use of previously produced material in other programmes. To avoid copyright problems, most of the material in EDIT has been produced by the faculty, but if other material is used, permission is obtained from the owner and the source is clearly stated. Programme co-ordinators have been appointed for the at times very time-consuming work of editing the scenarios.

The actual administration of scenarios and scenario parts is carried out by the EDIT webmaster. However, an easy-to-use administrative interface has been developed and later, this work could be done by the different programme administrators.

Implementation

EDIT started in semester five of the medical programme in 2001 and this semester has now been offered seven times. Students meet twice a week in the tutorial group to work with the problems presented by EDIT. Lectures and other learning resources are planned to fit in with how the scenarios are sequenced. The scenarios constitute the frame of the semester and are chosen in such a way that they exemplify specific fundamental phenomena.

In semester 5, 26 EDIT scenarios are presented, i.e. one or two scenarios per week. The development of new scenarios has continued, as shown in the table below. To date (April 2004), a total of 146 EDIT scenarios have been produced, most of them in medicine and nursing, where curriculum changes are implemented or under way. EDIT scenarios from medicine have also been used to prepare non-European physicians for a national test to become licensed to practise in Sweden.

<i>Programme</i>	<i>EDIT semesters</i>	<i>No. of scenarios</i>
Medicine	1, 4, 5, 6, 7	82
Nursing	1, 2, 4, 5, 6	46
Physiotherapy	2, 3, 4	7
Social Care	2, 3	10
Pharmacy	1	1

Over 900 students now use the EDIT system every semester, which means that the scenarios/cases are constantly evaluated and revised as a result of students' feedback. Both the medical and the nursing programmes use EDIT to present all scenarios during a certain semester while other programmes only use EDIT in a specific course or theme during a semester. The Nursing programme uses the system both for campus students and for distance students. New semesters and programmes will start using EDIT.

Evaluations

The pilot project in the fifth semester of the medical programme was evaluated during that semester and afterwards. Observations, focus group interviews and questionnaires were used to collect data. Evaluations showed that teachers as well as students were positive to the new way of presenting scenarios and that the objectives of the project were being met. The increased realism created by the multimedia components was much appreciated. The overall evaluation was positive with a rating of 8 out of 10. The observations indicated that more elaborate and profound questions are raised by students working with EDIT scenarios.

Most complaints were related to minor technical problems. Some students argued that the new scenarios presented too many cues and triggers. This higher level of guidance was perceived as exerting too much influence on the learning process. Measures were taken to solve the initial technical problems. The other more fundamental criticism was carefully considered and met by trying to make the scenarios more open in their design.

After these measures, implementation continued in the medical programme and the system was also introduced and later evaluated in nursing. In 2002, another evaluation of the project was carried out by a masters degree student focusing more on the actual use of the system and the interaction between users and computer (Kiviloog 2002). Also this evaluation revealed positive views of EDIT but some changes were suggested, a number of which have been implemented in the further development of the system.

The built-in system for evaluation gives continuous feedback to the scenario constructors and to the project group. This information is taken into account as the system and the scenarios are revised. The role and function of the web-based scenarios are also always discussed in the semester evaluations carried out by the teachers.

The evaluation form has been used in two ways. Most often, the groups send their detailed comments on the case, misspellings or suggestions for improvements. Students might also comment on the way the scenario has functioned as a whole. Sometimes, the groups end up with questions that, despite all their efforts, they have not been able to answer or have not fully understood. These questions are often dealt with at a resource lecture to which many teachers are invited. Students can now submit these questions in advance and teachers can therefore come better prepared.

Lessons learnt

The introduction of web-based scenarios has been very successful and EDIT has become an integrated part of the PBL curricula in many undergraduate programmes. Both students and teachers appreciate EDIT scenarios as being much more fun and stimulating to work with than the former “paper cases”.

A number of lessons have been learned about how a well-functioning web-based PBL scenario should be selected and constructed. Scenarios should reflect priority health problems in the population and be relevant to the semester in question and its objectives. Exemplarity in the selection process and a variation of patient cases and other situations are aimed at. Triggers/documents should be easy to grasp and raise questions, not give answers. There is a risk of overloading scenarios, which could give the group too little time for reflection and brainstorming in relation to the triggers. Multimedia material should therefore be used selectively to stimulate more senses and evoke feelings. EDIT must not be looked upon as a learning resource or a replacement of textbooks or information websites.

The web-based presentation form makes all scenarios “public” in the faculty, which means that they can be seen and scrutinised by many more teachers than before. Based on feedback from students and teachers, most scenarios have been changed and improved several times. In our experience, such changes are much harder to achieve when using paper scenarios. The very process of creating new scenarios has highlighted the importance of scenarios in PBL and initiated an invigorating discussion about all the curricula.

The new complexity of the scenarios means that tutors have to prepare more carefully for the tutorials in order to facilitate the students’ learning process. To prepare tutors, meetings are organised before every new theme and the scenario constructors present their scenarios. In this way, the tutors all know what the idea behind a certain illustration or text is. Furthermore, the medical programme has a tutor’s page containing keywords as suggestions for studies.

In the beginning, there was a misgiving that EDIT would interfere with the group process. Our experience is, rather, that the web-based scenarios have strengthened the entire PBL process. It gets the group to focus on the same thing at the same time. It gets the students to brainstorm many times and formulate their learning issues in writing. Students also more frequently evaluate and reflect upon the scenario quality and function through the feedback system. Nevertheless, the

impact on the problem-solving process, learning process and group interaction needs further study.

To conclude, the quality of the scenarios has improved immensely with the addition of different kinds of multimedia components, which stimulate and motivate the students and can be used to evoke and provoke emotions as well as illustrating processes. The use of multimedia increases the realism of the problem and makes it easy to place the situation or the patient case in a true-to life context. Furthermore, EDIT has inspired pedagogical and methodological discussions within the faculty on the role of the scenario, the role of the lecture and general planning of the study semester. Co-operation between the educational programmes has increased in a rational way.

More information and three scenarios in English can be found at EDIT's home page: <http://huweb.hu.liu.se/edit/>

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References

Abrandt Dahlgren M, Öberg G. Questioning to learn and learning to question: Structure and function of PBL scenarios in environmental science education. *Higher education* 2001;(41):263-82.

Dolmans DHJM, Snellen-Balendong H, Wolfhagen IHAP, Van der Vleuten CPM. Seven principles of effective case design for a problem-based curriculum. *Med Teach* 1997;19(3):185-9.

Kiviloog L. Interacting with EDIT : a qualitative study on, and a re-design of, an educational technology system [Master thesis]. Linköping: Linköping University; Department of Computer and Information Science; 2002. Report number: LIU-KOGVET-D--02/14—S

Margetson D. What counts as Problem-based Learning. *Education for health* 1998;11(2):193-201.

Schmidt HG, Moust JHC. Factors affecting small-group tutorial learning: A review of research. In: Evensen DH, Hmelo CE, editors. *Problem based learning: A research perspective on learning interactions*. Mahwah, NJ: Lawrence Erlbaum; 2000. p.19-52.