

Virtual Collaborative Medical Education in Medicine

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VIRTUAL COLLABORATIVE ACADEMIC EDUCATION IN MEDICINE

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ABSTRACT

This paper presents a novel approach towards virtual collaborative medical education, which aims to confront the problem of ever expanding core knowledge and the necessity of handling over-specialized disciplines in medical education. Already proven, general purpose web-based learning and collaboration tools are used to create a virtual education network among medical institutions. Over-specialized scientists from different institutions develop individually or in collaboration (over the web) self-contained and well targeted educational objects which are then combined dynamically on a virtual e-classroom on the web in order to form integrated educational units. Each such complete educational unit can be shaped to support either traditional expert instructed teaching and/or self-directed problem-based learning, enhancing the emerging patient-oriented approach to medical education. This approach provides a means for medical academic institutions to enrich their curricula with external overspecialized expert knowledge and facilitate exchange and subsequent convergence of medical curricula.

KEYWORDS: medical education, e-learning, case/problem based learning, web collaboration

INTRODUCTION

The current enormous expansion in medical and biomedical knowledge constitutes a fundamental challenge in medical education. As the time frame of the medical curriculum cannot expand forever, some faculties have adopted the teaching of overspecialized educational modules as implemented by overspecialized educators. New educational approaches build on concepts of adult education, rely on situational learning and are active, self-directed, student-centered, and experiential educational programs. In order to support these emerging integrative curricula structures and accommodate the over-specialized knowledge available by different experts, information technology could be employed to develop virtual distributed pools of autonomous specialized educational modules and provide the mechanisms to create dynamically educational units and corresponding learning episodes by combining individual learning modules^{1,2}. This paper presents the approach of the IntraMEDnet project, where partners from 5 universities from 3 different European countries are setting out to develop a distributed pool of specialized educational modules in state-of-the-art scientific issues related to medicine, biomedical and biological sciences. Over-specialized scientists from different

institutions develop individually related educational objects which are then combined dynamically on a virtual e-classroom on the web in order to form integrated educational units. Each such complete educational unit can be shaped to support either traditional expert instructed teaching and/or self-directed problem-based learning, enhancing the patient-oriented approach to medical education.

TRENDS AND CURRENT APPROACHES IN MEDICAL EDUCATION

The current enormous expansion in the knowledge relevant to medical practice (ranging from genomics, neuroscience and epidemiology to decision making and medical informatics) constitutes a fundamental challenge to the educational mission of medical faculties. The traditional emphasis on teaching core knowledge of disease and patho-physiological principles, with the expectation that students will memorize the hundreds of facts presented to them, is outdated in light of this ever expanding knowledge base³. Teaching overspecialized educational modules as implemented by clinically overspecialized medical staff provides at first the fake idea of “modernized” education that can produce the feeling of self-satisfaction, but only in the absence of quality assurance of the educational product as the problem remains exactly the same given the rapid expansion of knowledge even within specific areas. Furthermore, the expansion of overspecialized training promotes a mono-disciplinary approach of the patient, far from the multidisciplinary real-life and the main educational objective on how to analyze, identify and solve the problems of patients. To summarize, two main issues arise in current medical education¹: (a) the problem of ever expanding medical knowledge creates the necessity for overspecialized disciplines, and the corresponding learning material and educators; and (b) medical education is driven towards a disease-based approach, rather than the more intuitive patient centered view, closely related to case/problem-based learning.

The problem of the ever expanding knowledge, core and discipline as well, questions the educational approach where knowledge is seen as a quantity that can be transferred from one individual to another. Current approaches focus on adult education and situational learning and are active, self-directed and experiential⁴, with a readjustment from process to product⁵. The emerging view is of learning as an active, constructive, social, and self-reflective process⁶ with the aim to develop problem-processing skills, self-directed learning skills and group competence⁷. These basic research findings on learning suggest the need for educational environments that are learner-centered and knowledge-rich, guided by assessment, and situated in a community of learners⁸. Thus in current medical education, educational programs increasingly include case-based or problem-based learning and other small group instructional models, collaborative organizations to support student-faculty interactions, and technology-enhanced educational tools⁹.

There is currently an international trend to involve information and communication technologies in medical curricula, as well as, in continuing life-long medical learning. As in many cases of technological advancement, initially, these new technologies have been introduced as solutions to medical education problems of the past. However, after a certain point the integration of the technology into the frame of mind leads to what is known as a paradigm shift: a fundamental change in the perceptions of the environment brought about by new technology. It is in such a juncture that medical learning is currently at. The introduction of

new information technologies applicable to the learning experience covered by the blanket term “e-learning technologies” had the same effect. Initially the use of these new technologies consisted of almost copying existing courses and transferring them from the classroom to the Web. Information technology tools and environments have successfully been employed in supporting specific isolated aspects of medical education. However, their full potential remains to be exploited through technological solutions that will by large confront the problem of ever-expanding knowledge in medical education. In order to support the emerging integrative curricula structures and accommodate the over-specialized knowledge available by different experts, information technology can be employed to develop virtual distributed pools of autonomous specialized educational modules and provide the mechanisms to combine dynamically individual educational modules and create educational units and the corresponding learning episodes.

A NOVEL APPROACH FOR VIRTUAL COLLABORATIVE MEDICAL EDUCATION

Universities in regions geographically isolated and with limited communication means lack the opportunity to enrich their curriculum with courses given by external experts, while their researchers are restricted by the extra cost and time needed to sustain educational collaborations with remote institutions. Currently, a considerable number of European institutions are using a variety of web-based learning management tools to support their teaching. This gained experience indicates that similar web-based tools can support and enhance educational collaboration on a permanent basis among higher education and research institutions.

In 2006, the IntraMEDnet consortium of five Universities from three different European countries was granted a 2-year fund to establish a Mediterranean higher education intranet with the goal to employ already proven web-based learning and collaboration tools in order to create a virtual education network among medical institutions¹⁰. This approach is expected to have a twofold impact: (a) to advance and enrich the curriculum in Medical Schools, especially in peripheral universities that cannot easily develop highly specialized courses because there are not many high specialized experts in various state-of-the art topics available locally; and (b) to give the opportunity to highly specialized medical experts in peripheral universities to fully realize and exploit their teaching potential and broaden their audience on their specific state-of-the-art thematic area.

Potential users of the educational services developed in the IntraMEDnet project include: (a) the traditional undergraduate medical student; (b) the postgraduate medical student and the resident with particular didactic requirements, who apart from the educational obligation has the responsibility of routine clinical workload, thereby not always having the opportunity to directly attend courses; and (c) the medical professional, who is already into the working environment and aims to further their abilities and knowledge.

In terms of specific educational policies, the project addresses two different approaches in medical education and employs the most appropriate e-learning model for each approach. Central to our approach is the concept of discrete and self-contained educational objects that are highly specialized in state-of-the-art scientific issues related to medicine and biological sciences, and are developed by experts in each area. The individual development of these

objects emphasizes on high quality content, delivery and service. Content needs to be comprehensive, authentic and researched. Service should include the provision of resources needed for learning as well as any administrative and technical support needed. Delivery, through the supporting technologies is web-based and the interface of e-learning programs both for authoring content and for publishing is user-friendly with communication tools to support interactivity. Then, such individual educational objects are combined to either support traditional instructional teaching or new medical education approaches based on problem or case based learning.

For the needs of the **IntraMEDnet project**, the research teams of the partners involved in the project have identified general educational topics of common interest, based on current educational needs of the partners' institutions as well as based on existing expertise and excellencies within the partners. For each such general topic, specific learning objects of interest are being identified and described in detail. The major characteristics of these individual educational objects are the following: (a) they are self contained educational units; (b) they have well specified educational objectives; (c) they are thematically targeted and overspecialized; and (d) they have been developed by overspecialized experts in the specific thematic area. Furthermore, detailed educational object attributes include: creator (person and institute), target institute and course, type, educational goal, target audience, educational objectives, learning outcomes, teaching methods & strategies, content outline, evaluation strategy, learning hours/workload, provision of continuous updates (life cycle information), language(s) of instruction, and bibliography.

The development part of the IntraMEDnet project that supports traditional medical teaching is more closely aligned with traditional classroom teaching. In this case, a needs analysis is employed to investigate demand for instruction, need for an online course, and possible equivalence of an online course with traditional components of a medical curriculum. The needs and expectation of students is indirectly identified by probing the educational needs of the different partner institutions. Once the topics of interest are identified the educational material is compiled out of individual educational objects to form lectures, practicals or/and courses. The e-learning process is then described in terms of learning models' choice (e.g. constructivism, behaviourism, etc), definition of learning objectives, delivery methods and assessment along with the development strategy and tools (LMS and related technology used). Current identified topics of interest within the consortium include: medical informatics, health and safety, scientific knowledge management, and advanced techniques in diagnosis and therapy.

Developing the part of the IntraMEDnet project that supports problem- and case-based medical education relies on the dynamic, on-demand compilation of various individual educational objects to support and realize a specific medical didactic problem. In this case, a thematic area of interest is identified and a pool of individual educational objects are developed as described previously. These objects can be the same as the ones used for traditional teaching. However, as this educational approach is based on didactic problems, the individual educational objects are brought together by means of various storyboards or roadmaps especially developed for students to follow so as to conquer the required knowledge via an integrated learning episode. The case of teaching telemedicine within a Medical Informatics course is currently being addressed. Specifically, a taxonomy for teaching telemedicine has been defined¹¹ to support the

organization and management of individual learning modules, while a case authoring tool has been developed to facilitate didactic case compilation for inclusion in generic learning management systems¹².

All educational activities in the IntraMEDnet project are deployed via open source generic learning management systems already used by the partner universities. Central to this activity is the employment of the emerging e-learning standard Shareable Content Object Reference Model, SCORM¹³. SCORM has been designed by the U.S. Government's initiative in Advanced Distributed Learning (ADL, <http://www.adlnet.org>) as a set of eXtensive Markup Language (XML) based specifications to define, manage, access and deliver modular educational objects so that they can be easily shared among different learning management systems.

To summarise, in facilitating medical teaching collaboration, the IntraMEDnet project is currently seeking the full exploitation of the following:

- web collaboration environments for module design
- classical web collaboration or more contemporary Web 2.0 tools (like Wiki, or Blog) for the choice of teaching strategy
- SCORM compatible LMS for structuring course and making it available
- multimedia authoring tool(s) for creating (original) content
- parts of LMS or other survey tools for online course evaluation

DISCUSSION

This paper outlines the efforts of the IntraMEDnet consortium towards virtual collaborative academic education in medicine. In this context, the project sets out to support with appropriate educational approaches two major issues that arise in current medical education: (a) the problem of ever expanding medical knowledge which creates the necessity for overspecialized disciplines, and the corresponding learning material and educators; and (b) the need for the more intuitive patient centred view in medical education, closely related to the emerging holistic approach in medical education that is based among else on problem- and case-based learning. The teaching policy in IntraMEDnet is based on developing distributed pools of individual self-contained, well described, highly specialized educational objects, each developed by the most appropriate expert in the field. At a second stage, such objects are combined either by an instructor to form a traditional instructional educational module of high quality or are dynamically combined via a problem/case-based learning episode. Both approaches are delivered via generic web-based learning management systems and related tools. Current work concentrates on the development of a web-based collaborative environment to support the identification of partners' educational needs and excellencies while it considers the potential of this virtual collection of educational objects to grow into an integrated distributed environment with mechanisms to automate learning module management and retrieval.

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