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Using a web-based system for the continuous distance education in cytopathology

Nikolaos Stergiou[a,*], *Giannis Georgoulakis*[a], *Niki Margari*[a], *Dionisios Aninos*[a], *Melina Stamataki*[a], *Efi Stergiou*[b], *Abraam Pouliakis*[c], *Petros Karakitsos*[a]

[a] *Cytopathology Department, University General Hospital 'Attikon', Haidari, Rimini 1 - 12462, Athens, Greece*
[b] *Department of Cytopathology, "Laikon" Hospital, Athens, Greece*
[c] *Research and Development, Space Hellas S.A., Athens, Greece*

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ABSTRACT

Background: The evolution of information technologies and telecommunications has made the World Wide Web a low cost and easily accessible tool for the dissemination of information and knowledge. Continuous Medical Education (CME) sites dedicated in cytopathology field are rather poor, they do not succeed in following the constant changes and lack the ability of providing cytopathologists with a dynamic learning environment, adaptable to the development of cytopathology. Learning methods including skills such as decision making, reasoning and problem solving are critical in the development of such a learning environment.

Objectives: The objectives of this study are (1) to demonstrate on the basis of a web-based training system the successful application of traditional learning theories and methods and (2) to effectively evaluate users' perception towards the educational program, using a combination of observers, theories and methods.

Implementation: Trainees are given the opportunity to browse through the educational material, collaborate in synchronous and asynchronous mode, practice their skills through problems and tasks and test their knowledge using the self-evaluation tool. On the other hand, the trainers are responsible for editing learning material, attending students' progress and organizing the problem-based and task-based scenarios. The implementation of the web-based training system is based on the three-tier architecture and uses an Apache Tomcat web server and a MySQL database server.

Methods: By December 2008, CytoTrainer's learning environment contains two courses in cytopathology: Gynaecological Cytology and Thyroid Cytology offering about 2000 digital images and 20 case sessions. Our evaluation method is a combination of both qualitative and quantitative approaches to explore how the various parts of the system and students' attitudes work together.

Results: Trainees approved of the course's content, methodology and learning activities. The triangulation of evaluation methods revealed that the training program is suitable for the continuous distance education in cytopathology and that it has improved the trainees' skills in diagnostic cytopathology.

* *Corresponding author*. Tel.: +30 210 6090719; fax: +30 210 6090719.
E-mail address: nikos_stergiou@hotmail.com (N. Stergiou).

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The web-based training system can be successfully involved in the continuous distance education in cytopathology. It provides the opportunity to access learning material from any place at any time and supports the acquisition of diagnostic knowledge.

1. Introduction

Over the past decade the field of education has experienced the introduction of the Internet, which has radically altered the way humans teach and learn. The evolution of information technologies and telecommunications has made the World Wide Web a low cost and easily accessible tool for the dissemination of information and knowledge. It has been proved that the traditional learning theories can be applied in a web-based learning system and on the other hand web-based distance education technologies may improve education and support totally new educational systems, radically changing traditional universities and K-12 schools [1].

Moreover, new developments and constant growth of existing knowledge make continuous education vital for medical science and medical education represents a major category of lifelong education. In the field of cytopathology, teaching should primarily take place in front of the microscope, supplemented by real-case presentations, didactic lectures and audiovisual materials. However, not all hospitals can provide microscopes, dedicated in educational purposes and even fewer of them possess multi-header microscopes, which permit access to a higher number of concurrent trainees. Moreover, another common technique for teaching cytopathology to professionals, is the exploration of ambiguous cases. Trainees attempt to give a conclusive diagnosis in a situation where patient outcome would be unaffected. Experiencing pitfalls, such as a false negative or a false positive diagnosis, is of value as they help them not to carry such errors in the clinical practice. In this context, the cytology lab is the environment in which training takes place and the microscope is the means to delivery knowledge.

Using a web-based training program appears to be a really compromising solution in order to overwhelm the financial, workplace and time restrictions raised by the traditional educational methods in cytopathology. Moreover, a web-based training system can easily involve traditional learning methods and develop skills such as decision making, reasoning and problem solving, which are critical in medical practice [2]. Finally, the explosion of innovation in teaching/learning strategies arises the need for their effective evaluation. There is a need for educational research and ongoing evaluation must be considered to be a fundamental part of educational advance [3].

This paper presents the results of a pilot study that examines the use of a web-based distance education system, called *CytoTrainer*, developed in the CytoPathology Department of the General University Hospital "ATTIKON" in Athens, Greece, for the continuous education and scientific support of cytopathologists. The main goals of the current study are:

1. to demonstrate on the basis of *CytoTrainer* the successful application of traditional learning theories and methods in the continuous education of cytopathologists and
2. to effectively evaluate users' perception towards the educational program using a combination of observers, theories and methods.

The training system was designed and developed in such an way that would provide users with a flexible time and place of access. In order to describe the context in which the system was used and substantiate the evaluation study, the authors have included a description of the theoretical background of the educational model followed by a short overview of the system's functionality.

2. Theoretical background

2.1. *Educational theories*

Knowledge is a social phenomenon. According to Dichanz and Ernst [4], learning can be seen as *an individual process of interaction between the individual and his/her environment, in which the subjective reality of the learner is actively constructed*. Constructivism is considered as one of the most popular educational theories, according to which, *knowledge is not transmitted unchanged from teacher to student, but instead learning is considered to be an active process of recreating knowledge* [5].

In our educational program, knowledge is classified as explicit and tacit. Explicit knowledge consists of facts, rules, relationships and internationally accepted standards that are codified throughout the cytopathology literature. On the other hand, tacit knowledge underlies habits, personal skills and experiences and requires personal contact and collaboration. Tacit knowledge, possessed by experienced cytopathologists and gained through their practice in screening, is more difficult to be transmitted to the trainees.

In our web-based training system, knowledge is not transmitted individually, but throughout collaboration within a community of practice. A community of practice is a group of people who share *a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis* [6]. Moreover, any expert will tell you that people usually do not follow a process or formula or steps, but they will strongly support what they help create. Our intention is to encourage the entire learning community – and not only the "experts" – to undertake the task of creating and renewing knowledge, identifying what is valuable for their daily work. The role of trainers is to support this process, validate the knowledge and assure that it is relevant and continually updated. Finally, knowledge objects created during the above process should be made available, after validation, to the rest of the members of the learning community.