VISUALIZATION OF EDUCATION IN DENTAL MEDICINE AT FACULTY OF MEDICINE IN KOSICE

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Abstract

Development of modern education tools based on information and communication technologies effects also education processes in dental medicine. To make education in this area more effective, illustrative as well as progressive, we have been realized a project where audio and visual techniques were used together with the network infrastructure to bring students more detailed and illustrative explanations of clinical cases. Visualization of education was realized at the Department of Stomatology and Maxillofacial Surgery, where the network infrastructure was built as first. LAN was increased by fifty new connection places and the communication is operated by three fully manageable 1Gb switches. Ten HD video cameras and projection equipment with large screen displays were installed to interconnect surgery halls, ordinations and consulting rooms. All the realized interventions can be easily recorded, stored and accessed using high performance storage server. Other ten intraoral cameras with LCD displays were installed directly on the dental chairs. To see the details of any patient/clinician from any dental chair these are interconnected and the data can be saved on separate file storage server. Preclinical education is supported by visualization of models the students work on in phantom rooms. Specialized 3D scanner was installed and interconnected with 10 computers the students can use to evaluate their works. All the installed technologies allow us to communicate and to see the patients and/or interventions in real time. Individual processes can be also recorded, processed and archived to be useable for present and also for distance learning. Using of such multimedia tools helps teachers to explain practical problems in dental medicine in more efficient way.

Key words: dental medicine, visualization, video communication

Multifunction laboratory

To realize a conceptual design of multifunction laboratory we solved both clinical and technical problems. The clinical side of the project was solved by installation of new dental chairs, purchasing of dental materials and by

obtaining of necessary instrumentation and equipment for maxillofacial surgery. However, the technical part of the project required more things to be done, even if we consider basic network infrastructure and/or absence of information and communication technologies at the department. These were realized with respect to existing building architecture.
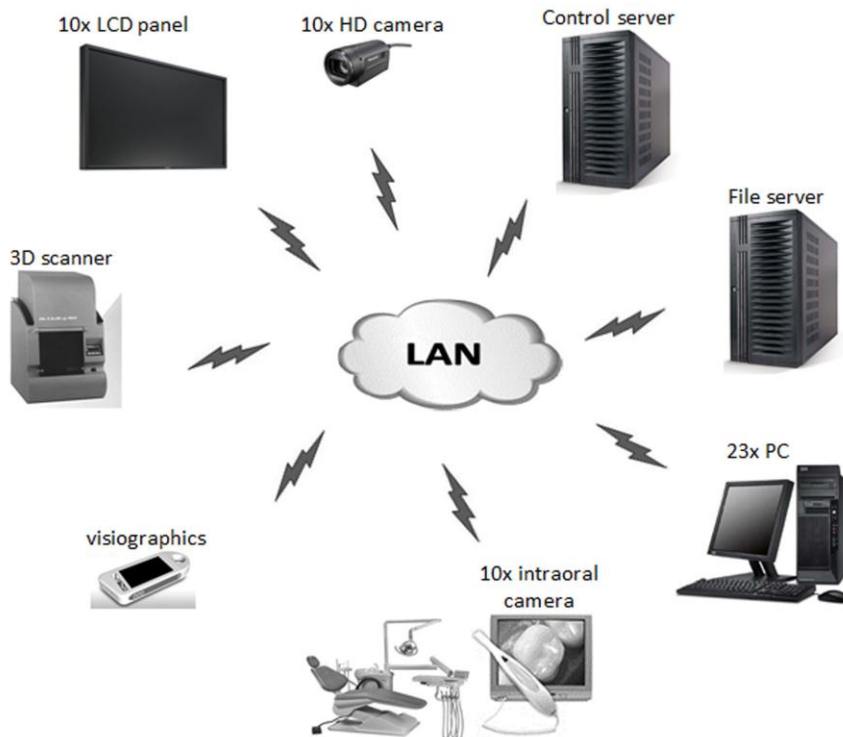

Figure 1: Main components of the education systems installed in multifunction laboratory distributed across clinical rooms of the Department of stomatology and maxillofacial surgery.

The first step in realization of our activities was to build an infrastructure of computer network and to establish Intranet in which the individual workplaces were interconnected. To do this we increased the number of network connection places from 22 to 72 using three 24 100/1000 port switches. The bone of the network was interconnected through optical fibres directly to the university network that ensures quality and stability of connection. This is important in cases when needed to transmit some real or archived events out of the clinic.

Ten HD video cameras were installed together with large screen LCD displays across the clinic in the next step of the project realization. Using network infrastructure the cameras send content to the server that distributes it to the co-workers' workplaces and/or archives it at the same time. This ensures that the records will be available for later usage in education processes. Other ten intraoral cameras were installed at the dental chairs. These allow us to see details in the mouth of patients through dental chair LCD panels. Video content obtained from these cameras can be stored on network storage system that works also as a central unit of the network of these intraoral cameras. In combination of interconnected RTG and viosiographic unit the clinicians have access to all necessary images and video documents almost immediately it is generated. Except of others, the advantage is that the patient can be treated by doctors that have all the available documentation.

Figure 2: Two different maxillofacial interventions. Such long-lasting procedures may be offered to students via detailed education documentation.

The graphical data are also used to build a surgery interventions database. The process starts with creation of records and preparation of relevant clinical documentation. Until now, we used two approaches to develop education works. First approach was aimed to prepare a movie with comments of surgeons and/or other clinical professionals. The output was CD or DVD playable in any PC or DVD player or it was transformed to the on-line form too. The second approach extended possibilities of digital presentation techniques and added the educational texts and other related scientific content to the output multimedia materials. In this case, the interactive material contains text, audio and video to offer students maximum information about relevant topics of the curriculum. The advantage of both approaches is that the students and

teachers have access to educational material that describes treatment procedures performed by professionals and are based on real clinical cases. Thanks to the multimedia support used in pedagogical processes the students can also see the long-time procedures as well as rare pathologies.

Preclinical education

To improve preparation of students for practical work with the patients at the dental chairs we have modernised also the phantom classrooms. There was a 3D vision system installed and ten additional computers for students. Such so called active vision system is based on reverse engineering approach. It means the system extracts the three-dimensional (3D) geometric information from the models of teeth the students work on and transfer this information into computer-aided design software to get the precise information about the quality of students' models. Recognizing deficiencies they are able to improve the accuracy of 3D teeth models and verify if their skills are going to be better in time. The system may be used also to improve the quality of construction units intended to help patient treatment. The 3D vision system offers much functionality like edge detection, boundary tracing, 3D modelling etc. All these functions may be used via software installed on computers connected to the vision system.

Education materials are projected to the students using visualizer that captures documents and/or 3D objects and displays them on flat screen, projector or interactive whiteboard. The advantage is that it allows to display very small objects and images can be also recorded and used to improve presentation of themes that are explained.

Conclusion

Main aims of our activities are oriented on new innovative approaches in education of dental medicine students that increase both the quality and the efficiency of realized clinical teaching processes. Using of modern audio-visual technologies brought possibilities to study individual clinical cases in more detailed ways. The recorded video outputs equipped with explanations of professionals, e.g. in the form of texts and/or audio comments inserted into the movies, can be easily used also for self-education and/or for distance education. Special attention is paid to treatment procedures of rare cases and special surgery interventions that may be viewed in real time via videoconferences or that may be used as a source of multimedia documentation.

The multimedia tools helped teachers to explain practical problems in more illustrative way. On the other hand, the students are better prepared for their future work as they are better prepared on situations they can meet in real clinical praxis. All multimedia education outputs are archived and accessed to students during lectures and/or practical exercises.

Acknowledgement

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