

# To Consider e-Learning in Dental and Medical Education in Japan

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## ABSTRACT

All of Japanese medical and dental schools have constructed information-technology network systems. But only about 10% of medical, dental, pharmaceutical, and health professional schools are using e-learning, and 60% are negative for planning to introduce e-learning systems. The IT or e-learning systems in medical and dental education in Japan are seen in the on line self-learning media for dissection for gross anatomy and media for simulated training systems for clinical diagnosis, treatments, and skills and the on line problem-based learning systems constructed through the electronic health records in the university hospital to approach data of the clinical examinations and clinical images such as X-ray and MRI images. And this paper introduce the author's experience to build up an atlas of histology, explanation movies for histology practice using images collected for broad casting TV programs for lifelong-learning of citizen of public, and e-learning constructed by students in a subject to study medical research techniques.

**KEY WORDS:** e-learning, medical and dental education, on line PBL, on line atlas of histology, e-learning constructed by students

## INTRODUCTION

In this paper, I describes e-learning in medical and dental education in Japan on my background of the long carrier as teacher in Hokkaido University Undergraduate and Graduate School of Medicine, medical clinician for about 10 years, leader of educational reform in Hokkaido University, leader of the Broad Casting Education Committee for about 10 years, committee member to develop the space collaboration system (SCS) to use an artificial satellite for distant education by National Institute of Multimedia Education. My specialty of teaching and research is histology to learn functional structures of the human body using light and electron microscopes; my logic of thinking depends on realistic images.

The Broad Casting Education Committee we had projected 13 TV programs for 45 min each in a subject in each year from a domestic broad casting station. Large amounts of video materials and schematic figures to introduce contents of various academic fields in universities in Hokkaido were assembled in the broad casting station. Thus I have begun to utilize some of these images for teaching. Through these experiences I have involved

in development of the e-learning.

The term "e-learning" is a well known in faculty of Japanese universities and the e-learning environments significantly growing in higher education in recent 5 years, but universities really using it in the curriculum are still remain small in number. This paper deals with e-learning in Japanese universities at first, then the situation in the dental and medical schools, and author's experiences in relation to e-learning.

## E-LEARNING IN JAPANESE UNIVERSITIES

E-learning systems provide self-learning environments on computer-based line systems or information technology (IT) network systems for students to be able to access anytime, anywhere and any pace.

According to the recent national survey of IT use in higher education institutes in Japan (Yoshida and Taguchi, 2005), computer-based network systems had been established in 97% of Japanese universities and 98% of universities for medical, dental, pharmaceutical, and health professional education. However, medical and dental schools using the network systems are now 100%, because these schools have constructed the system for the computer based test (CBT) to examine knowledge of each student just before entering the clinical training in the hospital. CBT and objective structured clinical examination (OSCE) to evaluate clinical skills and attitude are designed depending on the standardized educational objectives in the core-curriculum established recently by the medical or dental educational organizations (2001). It has been decided that CBT and OSCE are formally begun in this year (2005) after trials for a few years in every Japanese medical and dental school. Pharmaceutical schools have completed their core-curriculum and are developing their CBT and OSCE following medical and dental education. Health professional schools for nursing, occupational therapy, physical therapy, speech therapy (corresponding therapy by speech-language pathology and audiology) remain undeveloped about CBT and OSCE, because the standardized core-curriculum has not been established in these fields.

The national survey by Yoshida and Taguchi (2005) informs the following situation of e-learning at present.

Only 10% out of these schools are using e-learning, though nearly 100% of universities for medical professions have constructed IT network systems; 30% of universities for medical professions are planning to introduce e-learning systems but 60% are negative for planning on e-learning systems, and it is sure that no schools

are planning courses with credits only by e-learning.

Out of universities for medical professions, 50% have set up syllabi in the curriculum in the websites and 23% are planning the setting up, about 30% placed educational materials for classroom teaching and 21% are planning it, and 15% have the place to receive for questions from students and 22% are planning it, and 20% are planning to develop special soft wears or course wears in the web sites.

About 40% of teachers and students in universities are thinking that the development of web-systems for education in their universities increases effects of teaching and motivation of students, activates communication skills among students, and widens applications. However, most of teachers complain that the construction of the system is very expensive, a certain group of teachers become increased in work load, maintenance of the systems are expensive, technical supporting members are too small in number, preparation to use the system needs a time consuming laborious work, and suitable teaching materials are very limited for enormous varieties of subjects in the curriculum of various disciplines.

Among future planning and aspects in relation to e-learning, there are ideas to put various teaching materials in the home pages, to construct the sites for discussion with students, to set video materials for classroom teaching in the websites, and to exchange information between students on the websites. There are opinions that e-learning requires to combine face to face classroom teaching and supports classroom teaching from out side by accumulations of teaching materials for the classes in the websites. They said that for development e-learning it is important to be used by every teacher, to have enough educational resources, to increase the service thorough the web and to have technical specialists to be able to respond anytime for maintenance and trouble of the systems.

From the above national survey, we can confirm that the most of Japanese higher education institutes, including universities for medical professions, have architectures of IT systems and e-learning environments and are greatly expecting important effects of varies of applications on the higher education, but only small proportions of schools are using e-learning in the curriculum. For example, many universities have constructed a certain e-learning system on the web-systems established by own staffs or of a commercial product which for each course can provide the syllabus, teaching materials, bilateral information exchange board for teacher and students, place for the guidance of reports by student's homework, and various examination and evaluation. But only limited numbers of teachers are using this expensive system in surprisingly small numbers of courses. Most of teachers recognize that it is difficult to keep effective teaching only by e-learning for Japanese students. Face to face live teaching is essential for Japanese students who learn in undergraduate medical schools, differently medical students in USA learn in graduate medical schools after learning in undergraduate schools. For modern education in medical and dental universities in Japan, the e-learning systems is great and essential tools but complementary tools of live teaching in classrooms.

## **EDUCATIONAL RESOURCES IN E-LEARNING SYSTEMS IN JAPANESE MEDICAL AND DENTAL SCHOOLS**

It is sure that atlases of gross anatomy, histology, pathology, X-ray film images, and MRI on web-sites of the university are useful and effective in medical and dental education. Some universities provide such educational resources in their web-sites (Kochi University, Miyazaki University and others). In such cases, the construction of such materials on the web-sites depends on teaching staffs who are talented in IT technology, because rare Japanese medical and dental universities hire specialists for IT technology for creation of the various educational materials in the web-sites and maintenance of the systems. Thus, the universities with well organized original educational materials in the web-sites are small in number.

Recently problem-based learning (PBL) is introduced in most of Japanese medical dental universities. Some of them have begun to use the e-learning system to PBL. Kanazawa Medical University introduced the electronic health record system in the university hospital in 2000 and began to use the system combining the electronic syllabus for PBL. The data-bases about various clinical cases are piled up in the electronic health record for education avoiding personal information of the patients. A student can record history and findings of the physical examinations on the electronic record after the interview with the patient and propose clinical examinations. The teacher reads the record by the student, gives the advice and demonstrates the results of the clinical examinations. Through these repeating interactions between the student and teacher on the web-site, the student can reach proper diagnosis. During this study, the student has to often visit the patient; thus the student can learn communication skills and attitude for clinics. For this system, 30 computers were set up in a room in the hospital. It is visible how many times the teacher approached to the student and how guided the student on the website. Therefore, this is used for the educational evaluation of the teacher.

Recently many university hospital have become introduced the computer managing system; the health records in this system contain large amounts of data such as results of various clinical examinations, pharmaceutical records, nursing records, medical images such as roentgenogram, CT, MRI, pictures of endoscopes, vascular images, and microgram of pathological tissue and others. They work as live materials for PBL. Thus several universities have begun to use these resources for PBL.

## **EXPERIENCES OF E-LEARNING MATERIALS**

In 1984, Hokkaido University produced a series of TV program about human body consisting of 13 programs 45 min each and projected them form a domestic broadcasting company. In 1984, I joined to the Broad Casting Education Committee to make TV programs and radio programs to introduce academic contents to the citizen of public. I designed the contents of each program and supervised the making videos by staffs of the broadcast-

ing company. The series consisted of the history of medicine, bones and muscles, digestive system, teeth and eating, respiratory system, endocrine system, skin, nervous system, mental system, circular system, sleep and circadian rhythm, urinary system and reproductive system. One lecturer for each program was appointed among the staffs in Hokkaido University and universities in Hokkaido. I discussed with the lecturer about details of my design, and completed the scenario with the director of the TV movie company, and supervised taking videos for the subjects, editing and forming the final complete package for broadcasting in the studio of the broadcasting company. Each video consisted of lecturer's explanation about the contents and talking with the announcer, showing movies, pictures, and various figures. Each program was broadcasted on TV once a week for about 3 months. The audiences were 50,000 to 150,000 in Hokkaido according to the audience rating. The TV program making required nearly 3 years from the planning to broadcasting and persons above 60 or more in numbers worked for the series. This was an opportunity to learn video making for me.

After this project, I had continued to produce various series of video programs and radio programs for about 10 years in the broadcasting project of Hokkaido University. Great numbers of moving images were increasingly accumulated by the project and they appeared good as teaching materials in the university also, because the contents of each program introduced contemporary academic topics.

My specialty for teaching was histology. In 1986, a TV system including a TV microscope, video editor and 16 monitors were equipped in the histology laboratory for student's practice to observe histological sections. In 1986, we made 19 videos for explanation today's practice of histology; each video was made using moving images used in the TV program mentioned above, adding new histological images and narration to explain points of observation, 20 to 24 minutes in length. To complete 19 videos, it took 5 months. Every histology lab was open by watching the video.

In 1999, computers connecting with university websites were set up in the school for computer literacy education, and 20 computers among these were set up in the histology laboratory. Thus, we made an atlas for histology lab including 1000 or more light microscopic and electron microscopic images and written explanation on the home page. The 19 videos, described above, were digitalized and re-edited to set up these in the home page. It took about 3 months.

Students became to approach to the learning materials in the home page any time from their computer or computer in the school. Students in the histology lab observed the tissue sections by microscopes, often referring the atlas. And students often repeated to watch the explanation videos when they had question during the observations. We could hear the voice of explanation from many computers in the laboratory during the microscopic observation practice. This worked just like helps by several numbers of teaching assistants. It was obvious that the atlas and videos helped learning of students. The histological images shown in the atlas and

videos were from the same specimens which students used in the practice. This appeared increased motivation to learn for the students and educational effects.

From these experiences, we have learned that construction of systematic educational materials in the websites needs laborious works for long days with specialists of computer literacy, but even static or short moving images for a few minutes give great impact on students for understanding. Recently, digitalized imaging tools are easily available to set up pictures and movies in the websites. These images may become more useful if the database of images is constructed.-

### **E-LEARNING ENVIRONMENT THAT STUDENTS FORM IN SMALL GROUP LEARNING**

We created the e-learning environment by students. In 1999, a small group learning class of 4th year students was designed to learn and understand various medical research methods, as follows. The class of 100 students is divided in to small groups of 7 or 8 students and each group learned a medical research method different from others. The group learns what is the principle of the research method, what kinds of machines and tools are used, what is the structures and handling principle of the machines or tools, what kinds of specimens are prepared for it, what kinds of data are obtained, and how to analyze and explain the results, in order in the course. Students have to record on their homepages what they learn after every class; the homepages are formed in the school website by each group in the first class. Students have first to learn from books and later they can visit a researcher for interview to know the reality of the method and can visit laboratory for inspection to get the reality of the method. Teachers set up the course homepage to show the syllabus and bulletin for communication on the website before beginning the class. Students and teachers can enter the student's homepages from the list of the medical research methods in the course homepage.

Students have to report what they studied several times using their homepages during the series of classes. Students have to built up presentation materials in the homepages. The day of the last class is the day of presentation about the research method that they learned. They use presentation materials in their home pages. Thus, finally a homepage for various medical research methods is completed and kept in the school website.

E-learning environments are generally for individual students but the above course was characterized by face to face interaction, cooperation between students, and learning on group dynamics.

### **COMPUTERS AS LEARNING TOOLS FOR MEDICAL AND DENTAL EDUCATION AND LIFE-LONG LEARNING**

Medical and dental education is the discipline that e-learning works most effectively. The materials for e-learning can be easily prepared because various images in medical and dental fields are digitalized in memory,

piled up in the web-sites, updating contents. However, medical and dental education can not be completed only by e-learning. Face to face teaching becomes more important as e-learning becomes more developed, because Japanese medical and dental education starts from integration of the students into college life and studies in undergraduate schools, differently from post-graduate schools which can start as adult education in United States. Development of humanity, human understanding, and ethics are important objectives for medical professionals are obtained by interactive studies among students. Any of laboratory studies such as gross anatomy dissection, histology and pathology lab, physiology lab, biochemistry lab, and practice of clinical diagnosis, and clinical clerkship can not be replaced by virtual e-learning environments, which are important as the complementary learning materials. Computers connectable with web-sites are essential tools like stethoscopes of physicians who need life-long learning.

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