

Original Article

Development and Status of e-Learning Program at Tokyo Dental College

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Abstract

This article reports the development and current status of an e-Learning system (hereafter, referred to as “ELS”) at Tokyo Dental College. The ELS was developed to promote self-study. In order to achieve this, all new students were encouraged to use a notebook PC, and an intramural IT environment providing full, wireless LAN Web access was established. One key aspect of the ELS is the inclusion of a series of organically integrated lectures. This system represents a new departure in the development of fully technology-integrated dental education, providing a program which allows the student to select “unified themes” which incorporate those tackled in the standard curriculum as “systematic subjects”. Integrated learning is further enhanced, as the system contains “topic spaces” which allow access to all related topics and information throughout the entire system in order to support cross-sectional learning by each student. The system was developed based on the following 2 criteria: 1) there must be relevance to the standard syllabus; and 2) the contents must be relevant to problem-based training. The results have indicated that the ELS is effective and helpful to the students, and there are plans to expand the contents of the system. Further refinements of the system should make it even easier to use for both students and teachers.

Key words: e-Learning—Education—Integrated system

Introduction

Information and communication technologies (ICT) have now become an integral part of the dental education environment, with both students and staff regularly using all aspects of computer technology. For example, many courses now use presentation software and videos, with students collecting further information from the Web¹⁾. However, there

are still relatively few classes that have created the teaching materials they use^{4,7)}. At Tokyo Dental College, all new students are encouraged to use a notebook PC, and an intramural IT environment providing full, wireless LAN Web access has been established. This article reports the development and current status of an e-Learning system (hereafter, referred to as “ELS”) which was developed to promote self-study at Tokyo Dental College.

Materials and Methods

1. Background to introduction of ELS

The mission of Tokyo Dental College is to provide society with fully-qualified personnel educated not only to the highest standards of their profession, but also first and foremost to be “good human beings”. With the aim of training students to be able to identify and resolve medical problems, the college has introduced a curriculum that encompasses both traditional subjects and unified subjects based on the standard curriculum. Students need both sufficient knowledge and technical ability in order to diagnose and treat the full range of medical issues which they will encounter in the course of their career. In order to achieve this, the college has introduced the ELS to promote self-study, aimed at allowing the student flexible access to learning materials at any time and from any location. Specifically, this has meant the introduction of wireless LAN-based Web technology and the encouragement of all students to use notebook PCs. A course on “information science” is mandatory for all students early on in their first year of study in which they are required to gain basic PC literacy and internet skills.

Educational content provided by each department may be uploaded to the system and accessed by students. At first, although the teaching materials provided were well-constructed and useful, overlap of content and lack of unity in terms of purpose and

format meant that establishment of a unified core curriculum was difficult. Therefore, it became necessary to reform the entire system with a view to establishing a more consistent and comprehensive online program.

With this in mind, all digital content for the ELS was reorganized and expanded to facilitate a fully integrated and unified learning program. In addition, to make this system fully accessible to both staff and students required the establishment of a more organically organized database incorporating an on-demand self-study program that would promote active learning on the part of the student. This was achieved, and the ELS now provides an opportunity for the students to experience a wide range of problem-based, inter-related content based on the traditional core curriculum. This program was fully operational by 2005.

2. Characteristics ELS

1) Organic nature of ELS

One characteristic of this system is that it achieves integration between systematic and unified themes by means of “limited themes”; that is, relevant aspects of a particular topic to be selected from discrete parts of the traditional curriculum (Fig. 1). This is something that has hitherto been absent from conventional e-Learning programs. With this new approach, the traditionally vertically oriented curriculum is supplanted by a more horizontally oriented program that allows more free-

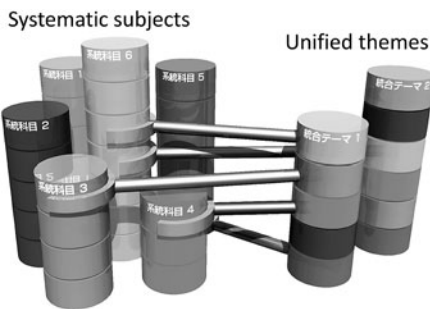


Fig. 1 Organically integrated structure incorporating “Systematic subjects” and “Unified themes”

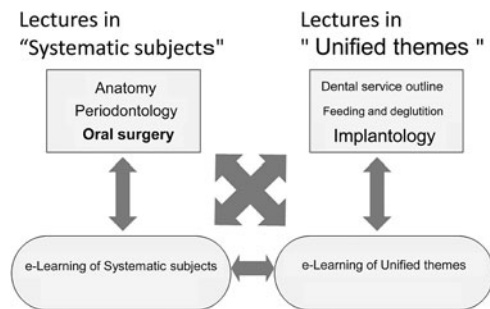


Fig. 2 Schematic of college aims for ELS

dom of access to themes based on relevance to any given medical topic (Fig. 2).

2) Concept of topic space

The function of the “topic space” in the ELS is to provide an organic link-up with the system as a whole (Fig. 3). It allows the student to select any topic, for example, “periodontitis”, and follow links throughout the entire system, not only to information directly related to periodontitis such as “inflammation”, but also those which are related more on an associative level such as “implantology” (Fig. 4). This

makes it easier for the student to grasp the full range of information and issues related to the topic which they have selected. From there, the student may go in any direction, depending on their interest or the problem with which they are faced. Thus, the topic space allows quick access to a wide range of related information and the students to build a database of knowledge for themselves.

3) Exercise function

Another function of the system is the exercise opportunities it provides. These exercises



Fig. 3 Topic space

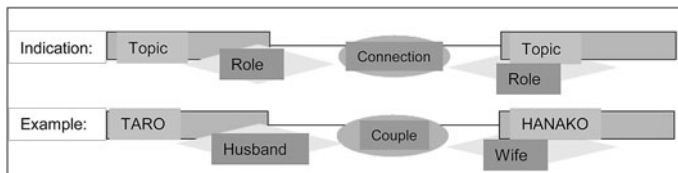


Fig. 4 Topic, connection and role

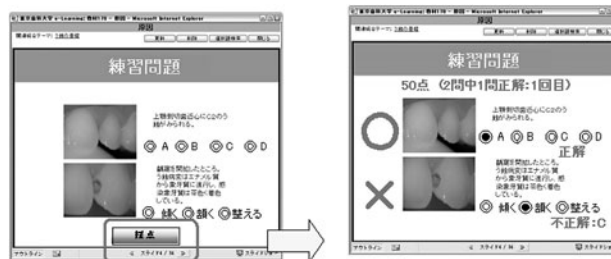


Fig. 5 Exercise function

are of 2 types: multiple-choice questions and questions requiring an answer to be written freely by the student. It is possible to set 50 questions per exercise and, with multiple-choice questions, feedback is transmitted when the user clicks a particular answer, with the result displayed immediately (Fig. 5). The system also allows the teachers to view the student's progress by viewing their history of answers for any given exercise and on any given date.

4) Teaching materials designed to promote ease of understanding

However well organized and organically integrated a system may be, it will not be effective if the student is unable to understand its contents. Therefore, this program has been designed to make learning as easy as possible by incorporating both visual representation and written, explanatory text. On the topic screen, the student can glance through English-language notation, synonyms, super-ordinates, a commentary about the topic, and the teaching materials provided in conjunction with that topic (Fig. 6). Again, the "systematic subject" and "unified theme" windows allow the student to search for a topic with the maximum ease.

The teaching materials provided are displayed when a folder is selected (Fig. 7). On opening a given folder, both a visual and written explanation are provided together to make understanding easier and faster. If an image is too small, it can be enlarged by selection of a higher-resolution image (Fig. 8). In addition, the "clip teaching materials" page shows the chapter structure for any given "unified theme" and allows the student to

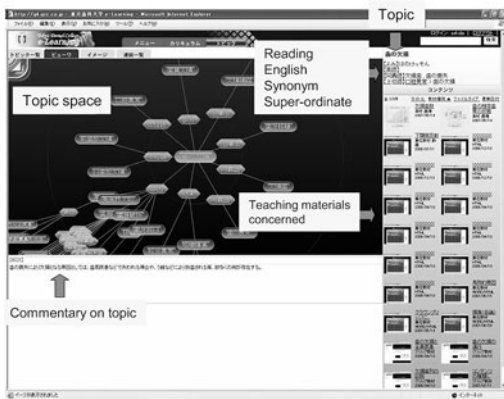


Fig. 6 Topic-learning screen

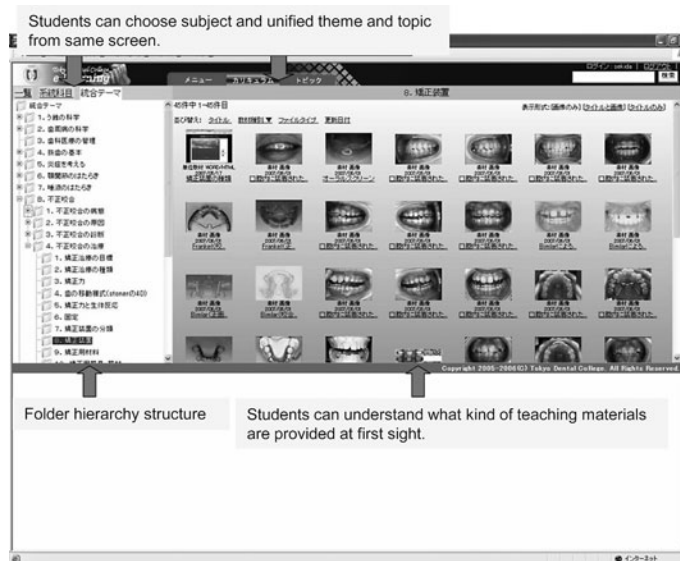


Fig. 7 Learning introduction screen

of exercises. When the student clicks “marking” after having answered all the problems, the correct answers are provided and the student can advance to the next chapter after confirmation.

5) Question and answer function

Questions certainly arise during the process of learning, and the e-Learning program has a “question and answer function”. A student can input a question, and the program will automatically deliver an acknowledgement e-mail while simultaneously transmitting the question by e-mail to the teacher in charge. The teacher in charge accesses the URL in the question e-mail, and sends back the answer to the student where it is displayed on the screen, and changes the status to “answered”. The system administrator can read the answer status and demand the answer from the teacher in charge if there are any “non-answered” questions.

6) Learning management

The teacher can confirm the progress of any student by means of accessing a learning

progress management screen. When a student reads the teaching materials, the date and time, student ID, and contents ID are all recorded onto a learning history database. The teacher can then read the student ID for the teaching materials and record the progress rate of a class by choosing the target clip teaching materials and each student’s target grade.

7) Reduction of burden on teaching staff and administrators

The unique structure of this system, allowing unified themes to be freely built from aspects of the traditional curriculum, greatly reduces the time and effort required on behalf of the teacher in constructing a new unified theme. Furthermore, it promotes interaction and mutual understanding between members of different faculties, encouraging a truly multi-disciplinary approach to dental education through cooperation (Table 1).

8) Educational effect on student

This system provides two benefits: 1) it allows teaching staff to monitor the direction

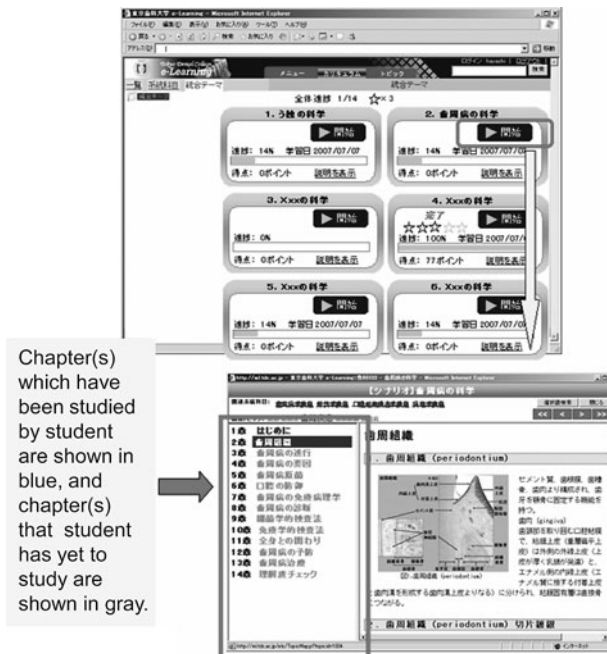


Fig. 10 Scenario mode

Table 1 Inclusion of integrated program

e-Learning	<ul style="list-style-type: none"> • Inclusion of visual contents • Support of self study
Organic cooperation	<ul style="list-style-type: none"> • Integration of core and unified themes • Construction of knowledge database by student
From basics to clinical and from clinical to basics	<ul style="list-style-type: none"> • Basics subject learning looking ahead to clinical application • Clinical subject learning returning to basics
Labor saving	<ul style="list-style-type: none"> • Inclusion of extra-mural Web content and lectures • Shared use of content between subjects • Use to supplement lectures and practical training

Table 2 The structure of the integrated program

Emphasis on relevance and state of knowledge on topic	<ul style="list-style-type: none"> • Teaching staff responsible for contents fulfilling requirements • Support for development of contents through educational development center
Progress management	<ul style="list-style-type: none"> • Evaluation and feedback • Teaching staff able to track content and response to teaching materials • Tutor responsible for each year able to grasp and provide advice on student's progress
Security	<ul style="list-style-type: none"> • Use accesses system through secure password • Network designed to ensure privacy
Evaluation	<ul style="list-style-type: none"> • Student evaluates system • External evaluation of student's progress • Student evaluates own progress

Table 3 Summary of hit count

Hits	
Total hits	3,025,710
Average hits per day	9,636
Average hits per visitor	264.14
Page views	
Total page views	60,322
Average page views per day	192
Average page views per visitor	5.27
Visitors	
Total visitors	11,455
Average page views per day	36

and progress of any given student, and 2) it promotes self-study by providing an easily accessible program that can be used flexibly, from a remote location and at any time. How the program is used will depend on the level of understanding and rate of progress of the student. In addition, while providing a wide

range of interesting, problem-solving-based material associated with any given topic, the core information as contained in the traditional curriculum will be reinforced by systematic repetition throughout the course of study (Table 2).

3. Dental Education Development Center

A working group committee was established consisting of a least one teacher from each department to coordinate this program. The function of this committee was to establish unified themes and determine which directly and indirectly associated links should be included for that theme. A Dental Education Development Center was established at the college in September, 2005. The staff of this center includes both a Chief and specialist staff whose sole duty is to undertake the development of this program.

4. Inclusion of commercially available software packages

The system also incorporates the commercial

software package “Internet Navigate” (Fujitsu Ltd., Kawasaki). This program can be used alongside the ELS to access to other programs

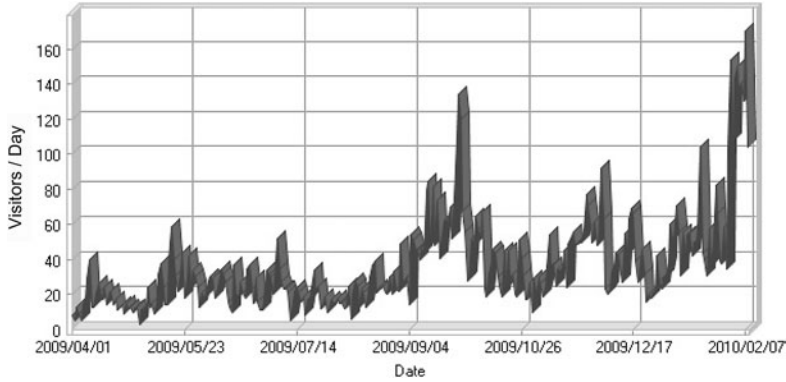


Fig. 11 Transition count of daily hits

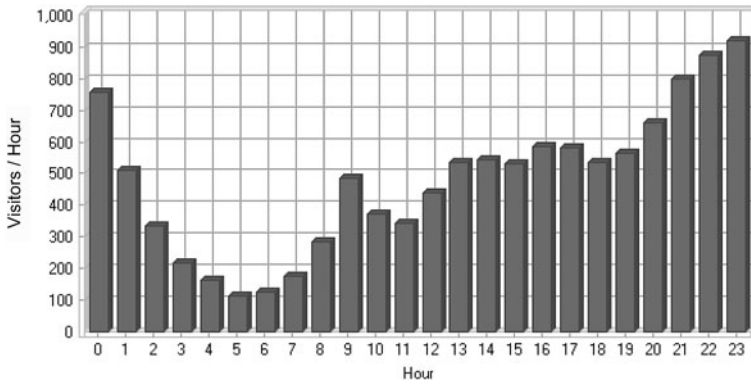


Fig. 12 Transition count of hourly hits

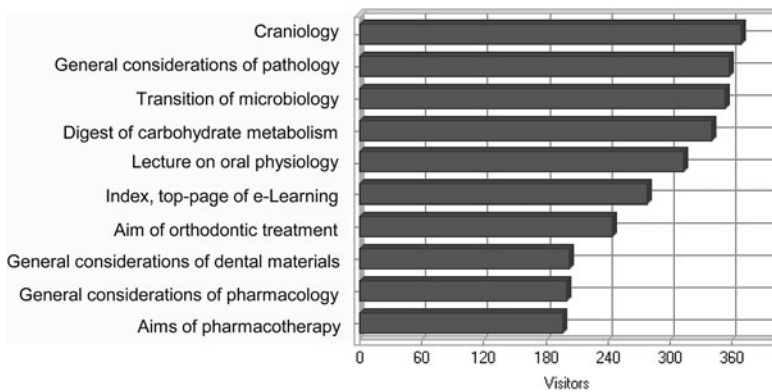


Fig. 13 Most popular subjects

such as “Word2003 basics”, “Excel2003 basics”, “PowerPoint2003”, “TOEIC470”, “Information Security” and “Information Science”.

Average hits per day = 9,636; Average hits per visitor = 264.14 hits; Total page views = 60,322; Average page views per day = 192; Average page views per visitor = 5.27; Total visitors = 11,455; and Average visitors per day = 36. The number of accesses per day to the site showed a tendency to increase over time, beginning with a sudden increase at the end of December, 2009, after the start of the

Results and Discussion

The following are the statistics to date for the ELS (Table 3): Total hits = 3,025,710;

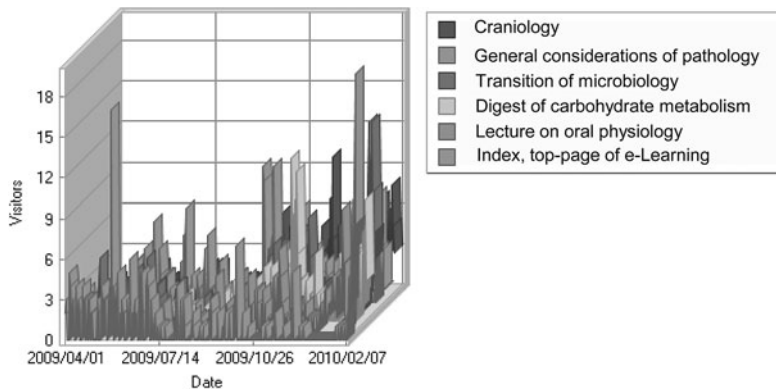


Fig. 14 Transition count of daily hits by subject

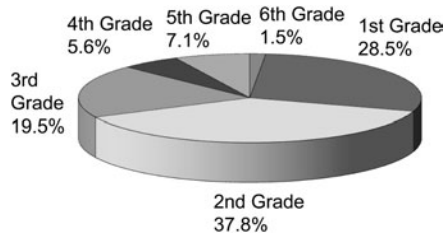


Fig. 15 User ratio by grade

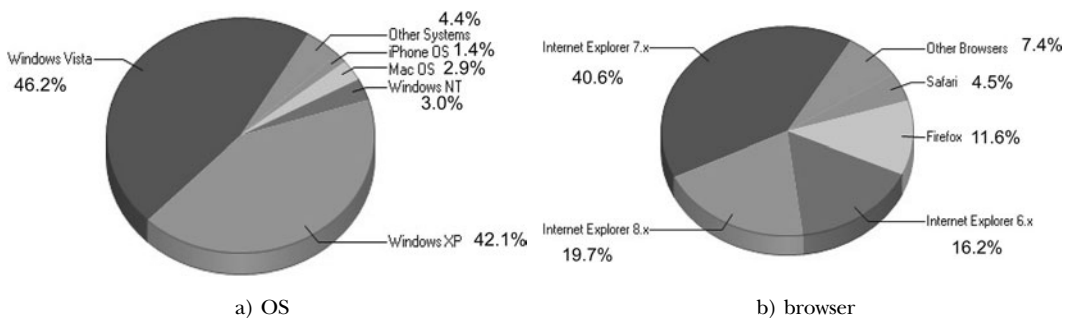


Fig. 16 Percentage use of each type

program (Fig. 11). It became clear that there were many visitors who accessed the program at night, between 21:00 and 1:00. Most people (920) accessed the program between 23:00 and 0:00 (Fig. 12). The lectures accessed most were in anatomy, physiology, pharmacology and microbiology, and those lectures were accessed frequently (Fig. 13). As time passed, access to higher level, specialized content increased (Fig. 14). This program is being chiefly used by the lower grade students (Fig. 15). The operation system used most was Windows, which was sometimes accessed from MacOS, iPhone, or other systems (Fig. 16-a). Most students used Internet Explorer of various versions, but other web browsers were also frequently used (Fig. 16-b).

The effectiveness of ICT for learning is widely recognized⁶⁾. However, it has been pointed out that, after initially setting up such systems, the expenses of updates and burdens on teachers gradually increase. Furthermore, computer literacy among teaching staff is generally low, and there are few support staff in dentistry education. Therefore, a great burden is often placed on specific individuals^{2,3,5)}.

We believe that the ELS at Tokyo Dental College will become even more useful as the contents are expanded. Further refinement of the system will offer continued improvement in benefits to students, teachers and administrators.

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