

The Long-term and University-wide ICT Strategies for Enhancing the Quality of Education - Experience of Kumamoto University -

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ABSTRACT

Although the quality of education and the management of the university can be improved through the appropriate adaptation of Information and Communications Technology (ICT), it would be difficult to plan long-term and university-wide ICT strategies because of the difficulty of evaluating their effectiveness and the rapid technological progress. Along with our university's long-term ICT plan (called the Integrated Campus Information System Plan), the Center for Multimedia and Information Technologies (CMIT) was started in 2002. After several investigations and testing of ICT environments (2002-2003), the Center introduced campus-wide LMS integrated with the student information system, and many types of large- or small- scale and on- or off- campus courses began in 2004, using the system. These experiences lead us to conclude that e-Learning professionals (unfortunately there is a lack of instructional designers in Japan) and campus-wide e-Learning supports are keys to improving e-Learning courses, both qualitatively and quantitatively. Subsequently the Graduate School of Instructional Systems (GSIS) and the Institute for e-Learning Development (IELD) were established in 2006 and 2007 respectively. GSIS is the Japan's first 100% on-line program for e-Learning specialists in corporate and higher education. Its Master and PhD programs in Instructional Systems emphasize four areas of expertise; Instructional Design, Information Technology, Instructional Management, and Intellectual Property. IELD aims to accelerate e-Learning research and practices, including the role of campus-wide e-Learning support services. These activities are bringing effective contents for distance- and blended- courses and integrated e-Learning systems such as LMSs, learning portals, learning portfolios, computer-assisted language learning systems and other custom-made systems through a single sign-on university portal.

1. Introduction

Information and Communications Technology (ICT) is expected not only to enhance learning environments but also to improve the quality of education in universities. The long-term and university-wide ICT strategy seems to be very important to introduce ICT successfully. The plan along the strategy is although necessary to be modified for adapting the rapid technological progress in many cases. It is not so easy to find the best solution for each university because of such a mobility, scale, place, purpose, and so on. This paper shows the example of ICT-based innovations in Kumamoto University.

2. Finding the advantage of ICT-enhanced education

Kumamoto University is one of the pioneers developing the Student Information System (SIS) in Japan. Our SIS named “SOSEKI” had implemented in 1999 and is a model of many other Universities (Usagawa & Nakano, 2005). Not only all teaching staffs open the syllabuses and set marks, but also all students make their own schedules by selecting courses on web browser as shown in Fig. 1 (Nakano, 2004). All fresh persons can use it because they actually started registrations in the required course for new students. The system has been improved year by year and it assists students to make learning plans for getting teaching credentials and some other licenses. This activity was awarded a grant-in-aid in 2003 for 4 years by the program named as “Good Practice” which was started by Japan’s Ministry of Education, Culture, Sports, Science and Technology (MEXT) to enhance the educational capabilities of national and private universities in Japan.

The experience taught us that such an ICT-enhanced student information system not only improves convenience, efficiency and paperless but also brings effective support for learning activities.

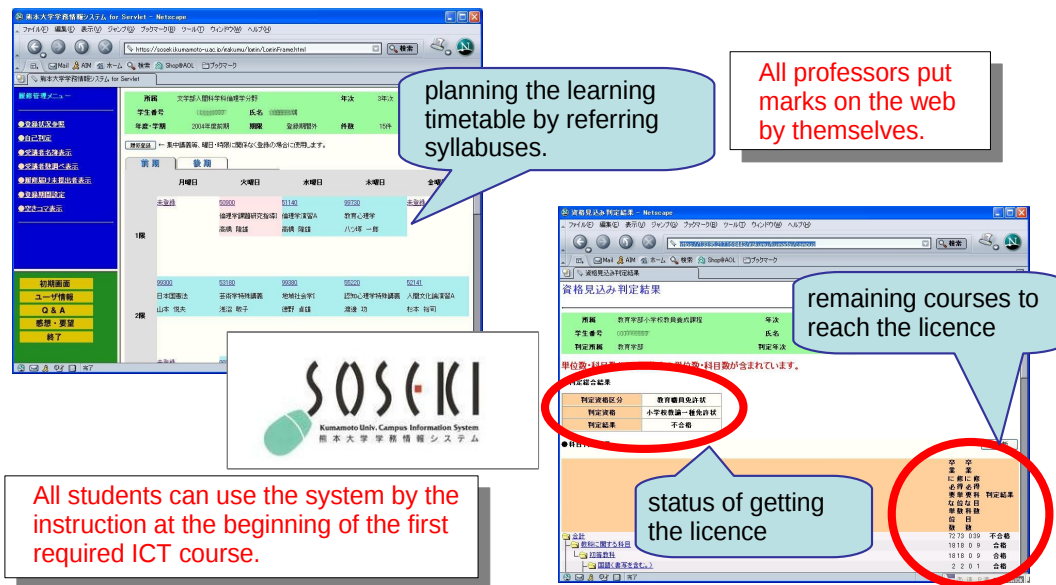


Fig 1. The Student Information System "SOSEKI".

As of 1996, courses on ICT literacy were delivered according to the necessity of faculties or even departments by lecturers who belonged to those faculties or departments. This means the course topics were depending on the lecturers and varied by lectures. It was not possible to lecture those topics without standardized text book. The university level committee of education had decided to issue the original textbook and the first issue of ICT literacy textbook was published in March 1997 (Usagawa & Nakano, 2005).

Although the textbook was designed and written for campus-wide literacy textbook, it was not easy to regulate the topics, the quality and the reached level of the lectures, because they still strongly depended on lecturers. In order to deliver the sufficient quality ICT literacy education for all of fresh students, a new organization for lecturers specialized for ICT literacy was started in April 2002; Center for Multimedia and Information Technologies (CMIT), Kumamoto University. One of the CMIT's main purposes is "University guarantees that all graduates from whichever department acquire the constant level information technologies".

In order to achieve the purpose, we implemented the basic courses of ICT literacy as required subjects of all faculties by sharing the identical contents in the blended learning style from 2002. The courses consist of "Basic Course of Information Technologies A / B" in the first (A) and second (B) semester for the fresh students.

They are rather large-scale courses with 1,800 learners, where WebCT is applied as a Learning

Management System (LMS) from 2003. Learners are divided into 29 classes with 9 professors managed by the use of cross-listed courses. The LMS is very effective for both styles of on- and off-campus learning, and is used for these courses in the blended learning style. Figure 2 shows a desktop sample when a student studying the course. Such an exercise is initially done in the classroom (on campus) with professor's explanations and TAs' aids. It is also possible to do at any time on campus and at home, because WebCT can be accessed over the Internet.

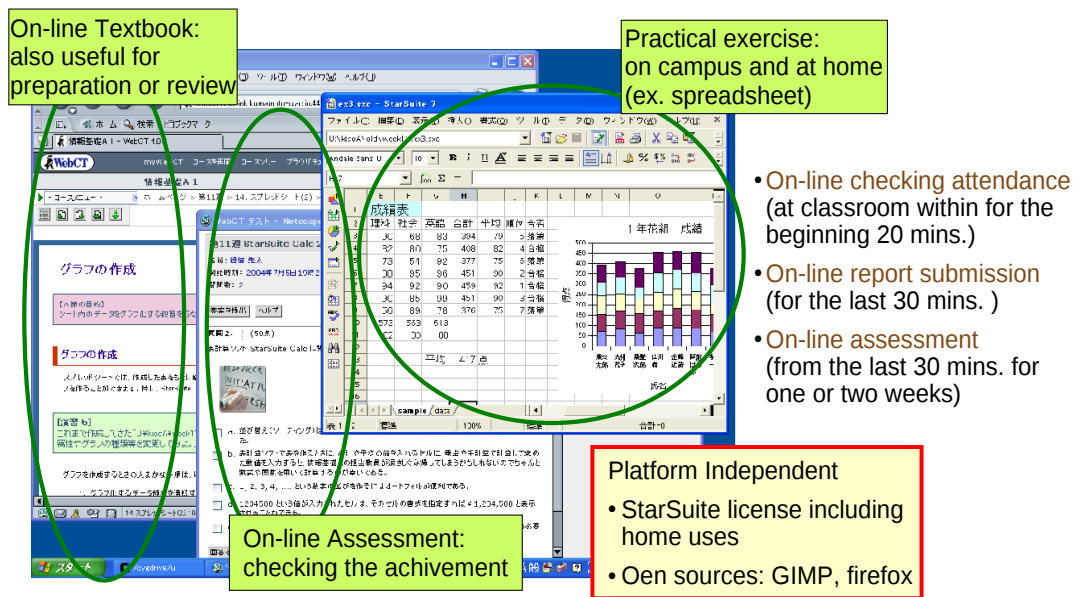


Fig 2. Desktop example of the course.

For the confirmation of the achievement and the relearning with the item that cannot be achieved, nearly 20 on-line assessments (or quiz or tests) are implemented for a year. All the assessments can be taken repeatedly in anytime within a fixed period over the Internet, and only the best mark is recorded as a result; nevertheless all the attempts are logged in the LMS server. Students can know the mark and comments just after finishing the test by automatic marking. The two examples of such weekly tests are shown in Fig. 3. These examples have different distribution of marks at the initial trial. They however have similar distributions at the final results after 1-26 times trials depending on students. More than 90% of students reach passing level at the end as shown Fig. 3. This activity was also awarded a grant-in-aid in 2004 for 4 years by MEXT of Japanese government.

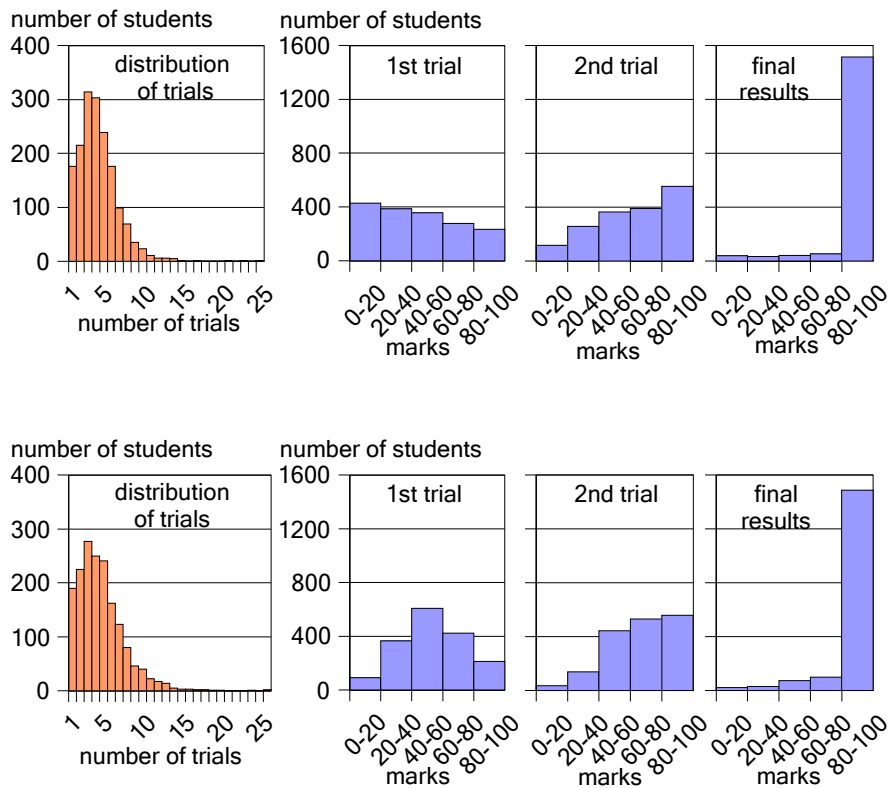


Fig 3.Effect of repeating assessment.

Such on-line assessments are quite effective for learning and can not be realized without ICT. Statistical data of the assessments are also very important for instructors, because the graph shapes are strongly depending on difficulty level of the questions and teachings (Nakano et. al, 2005). The experience taught us that such an ICT-enhanced learning environments not only expands learning opportunities at anytime/anywhere but also provides effective and efficient learning methods which can not be realized by traditional teaching styles without ICT.

3. Noticing the importance of instructional design

By the experiences of SIS and LMS, we confirmed that ICT can enhance not only the convenience but also the educational quality. The SIS shows which courses (means area of specialty) are required to graduate or to reach some licenses. The on-line assessments of LMS are quite effective and efficient learning methods. The LMS has many other functions such as discussion forum, tracking (learning logs), on-line presentation,

chat and so on. Some functions will be effective for some courses, subjects or teaching styles, for example, an asynchronous group work using the discussion forum might be effective for some project based learning. We noticed that effective and efficient courses must be well designed with knowledge of such functions and pedagogy, and the closest idea is the Instructional Design (ID). We thought that the ID professionals (IDers) should be staffed in a support center to expand ICT-enhanced learning university-widely. Although the ID is widely popular specially in US, there are very few specialist in Japan, and it was difficult to introduce such specialists into our university. Demand for such specialists seems to increase more and more as growing ICT-enhanced learning. Our university therefore decided to establish a new graduate school for developing e-Learning professionals with ID knowledges as an higher education institutions.

4. Established the Graduate School of Instructional Systems

As the Japan's first 100% on-line program for e-Learning specialists in corporate and higher education, Graduate School of the Instructional Systems (GSIS) started in April 2006 at Kumamoto University (Suzuki, 2007a, 2007b). The Master program started in 2006 and the PhD program started in 2008. To train e-Learning professionals four areas of expertise are emphasized. The four I's, representing our program's emphasis, are the followings: Instructional Design, Information Technology, Instructional Management, and Intellectual Property as shown in Fig. 4.

Graduate School of Instructional Systems (Master and PhD courses)

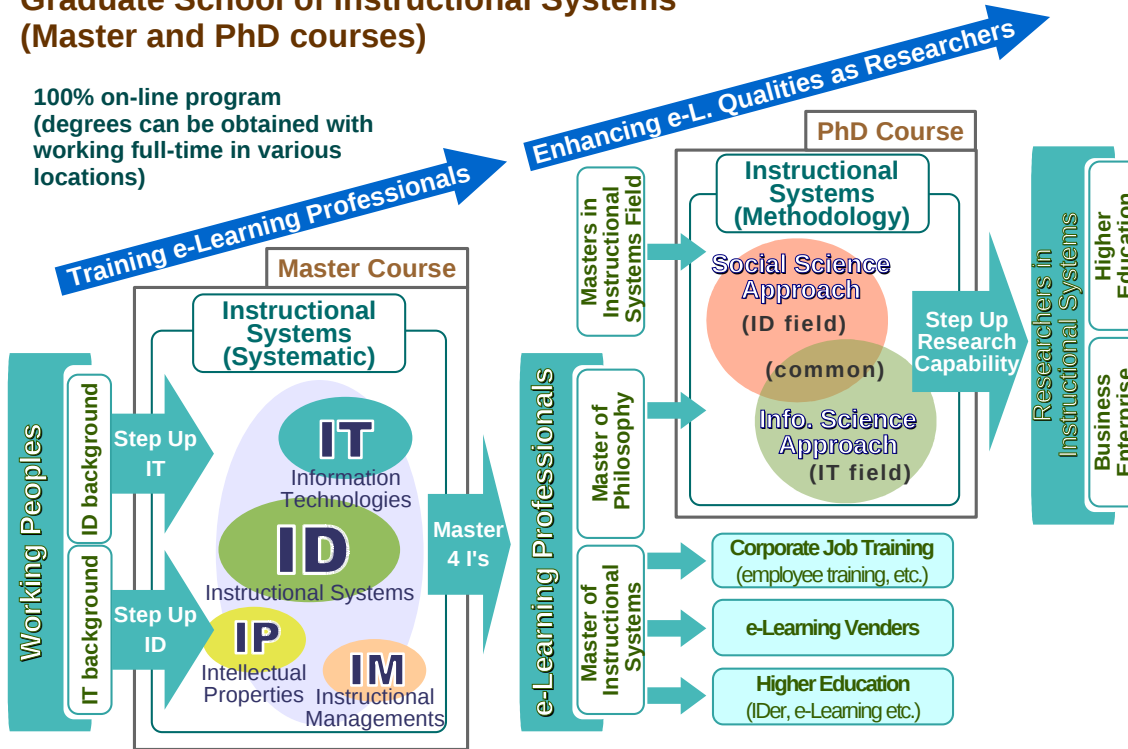


Fig 4. Graduate School of Instructional Systems.

The program was launched with 15 first year master's students, after being selected through rigorous admission process from 37 candidates. All of them are working professions in their 30-40's, working full-time in various locations: 10 living in Tokyo, 2 in Osaka, and the rest in Kyushu Island where Kumamoto University is located. The students are studying alone at home or offices, but capable of conducting independent study via the Internet with encouraging collaboration. Time management may be an issue, since they are working full time: Asynchronous mode of learning seemed to the most flexible learning environment for the busy professionals.

Almost all of the students have already been active in employment and many of them are concerning to the industrial trainings or higher educations. The school itself is therefore suitable for developing ICT-enhanced system, we started developing the learning portal just since its establishment. The learning portal aims to help students to learn in the comfortable and efficient learning environments over the Internet. We try to connect several e-learning systems as LMSs and SIS, and to add some functions into the portal to compensate existing systems. Specially, learner centered functions are emphasized, because LMSs generally provide course centered managements and SIS normally treat only school registers and the results of credits.

The learning portal is constructed by adding functions to the university portal, and is placed before entering e-learning courses as shown in Fig. 5, where the learning portal is named as GSIS (Graduate School of Instructional Systems) Portal (Nakano et al, 2007). In the program, students use WebCT CE6 as the main LMS and Moodle for exercises as contents creators, as instructors and as administrators. Each student has his or her own Moodle system on university site. We also provide VOD (Video On Demand) server, video conference system, and some original web applications (on-line computer programming exercise, file manager for VOD server and so on.) for the program.

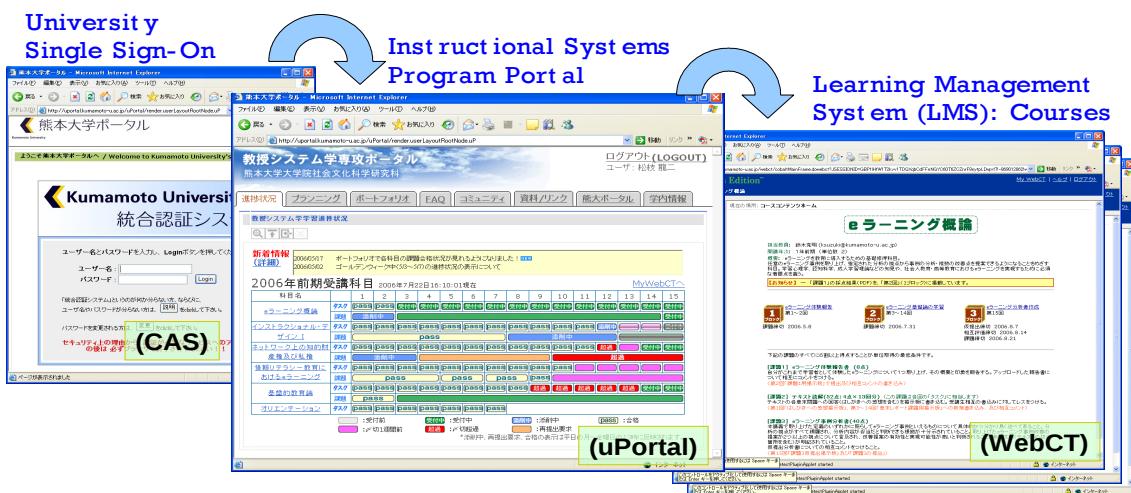


Fig 5. Single Sign-on from University Website to Program Portal to LMS.

MEXT (government) has selected the master’s program as one of the good practices in postgraduate education. With the grant from the government, the program are being developed through the following four projects: story centered curriculum development project, e-Portfolio system development project, global education strategies project, and work based learning project for corporate trainers.

5. Established the Institute of the e-Learning Development

The Graduate School of Instructional Systems successfully started, but university-wide e-Learning support was not realized yet. After a year from starting GSIS, in order to spread ICT-enhanced learning over the university, a new organization for developing e-Learning was established in April 2007; Institute of the e-Learning Development (IELD), Kumamoto University as shown in Fig. 6. The IELD is a cross-sectional organization consisting of four offices and “e-Learning Support Station” as one-window service. Many staffs

of GSIS, CMIT and staffs related to e-Learning in other sections joined in order to progress ICT-enhanced learning.

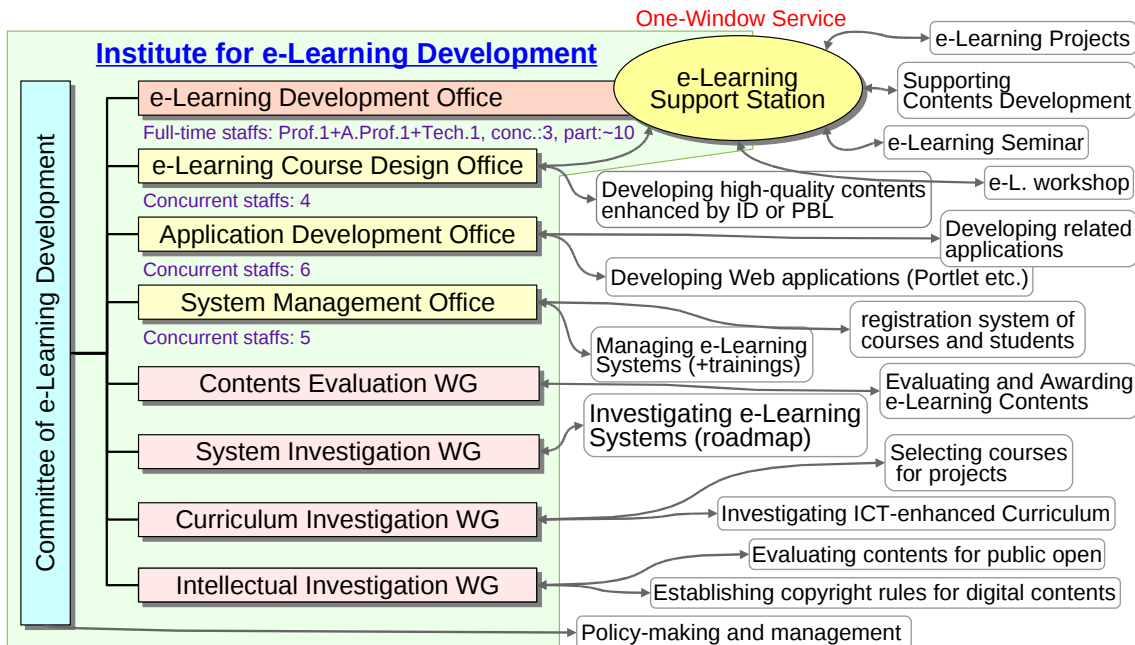


Fig 6. Institute of e-Learning Development and university-wide support.

The IELD is the one-window not only for inside university but also outside, for example, the responsible section for the convention with National Institute of Multimedia Education (NIME), which is the top research center for ICT based education in Japan.

6. Integrated Campus-wide ICT-enhanced Learning Environment

We have been advancing the ICT-enhanced learning environment as mentioned above; SIS, LMS and many related systems. Good collaborations among the systems should be important to build ICT-enhanced environments. However, there are some serious problems of authentications, data (profiles, etc.) sharing, smart navigation for user specific functions. For example, It is quite inconvenient for users to enter the user id and the password for authentication to enter each system, and to click many buttons and menus for finding desired place.

We developed the university portal for all students and staffs (teaching, technical and administrative) based on the uPortal, the CAS and the original tools for connecting several university-wide systems since

April 2006. Only with once authentication at entering the portal, he or she gets web page specialized for each user, where including informations for each role, direct links to allowable systems, the timetable linked to the corresponding course on the LMS, and so on.

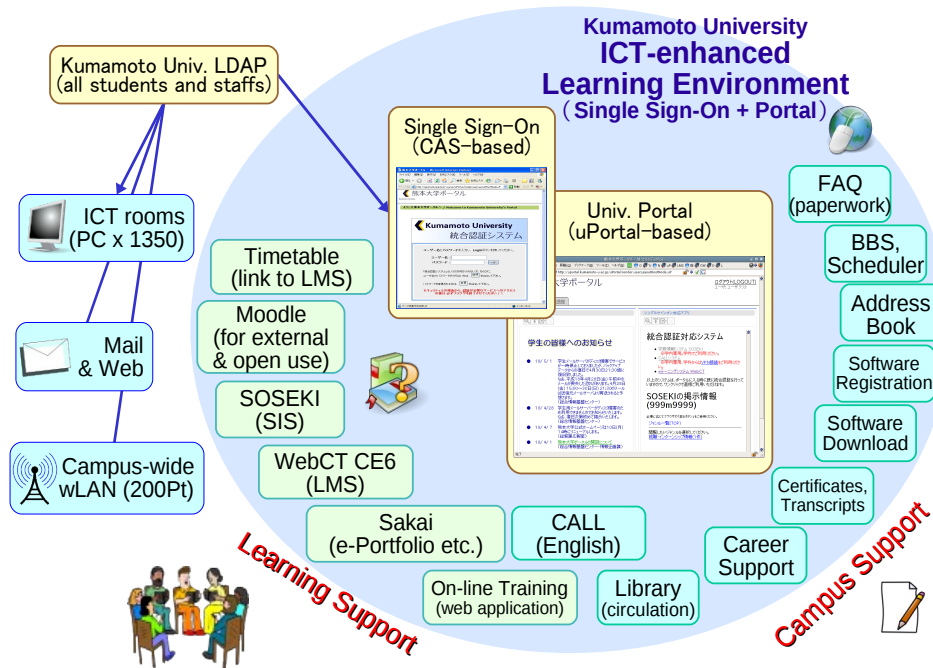


Fig 7. The Kumamoto university's ICT-enhanced learning environment with portal and the single sign-on system with web applications.

The portal is implemented based on uPortal which is a free, sharable portal under development by institutions of higher-education using Java, XML, JSP and J2EE and is developed by JA-SIG (<http://www.uportal.org/>). The uPortal supports the portlet (JSR-168, <http://www.jcp.org/en/jsr/detail?id=168>). Portlets are pluggable user interface components for a portal and are useful to add functions to uPortal. We therefore add some functions to provide appropriate information and functions for each role, position, department, and so on, for all members of university (10,000 students and 1,000 staffs).

The single sign-on service is implemented based on the CAS (Central Authentication Service, <http://www.ja-sig.org/products/cas/>) which is an open-source authentication system originally created by Yale University and became a JA-SIG project in 2004. The university-wide LDAP is used as authentic data source for the CAS, users therefore can login wireless LAN, PCs for IT classrooms (1,300 PCs over the university with exactly the same usability), emails etc. with the same user ID and password as CAS as shown in Fig. 7.

User profiles and registered course informations should be synchronized between SIS and LMS. We

developed a synchronizing system (Nakano et al, 2004) using the standard data format; IMS Enterprise Information Model (www.imsglobal.org/profiles/lipinfo01.html). When a course information such as registered students is changed on SIS system, the corresponding data on LMS will be corrected until next morning.

The uPortal supports the CAS by itself and some other web server applications were modified or adapted to support the CAS for convenience; SOSEKI (original SIS), WebCT CE 4/6 (LMS), Moodle (LMS), Sakai (LMS), the timetable, the library system (original), the university scheduler, the Computer Assisted Language Learning (CALL) systems, the network and application registration system (original), and so on. The CAS provides many libraries of clients for Java, .Net, PHP, Perl, Apache, uPortal, and others, and it is therefore not difficult to adapt existing web applications with their programming source codes. Even if some commercial systems do not open their source codes, there are some possibilities to adapt by developing adapters or connectors. We developed some applications for adapting the CAS, for example, we developed adapters using the portlets for WebCT CE4/6 (Nakano et al, 2006, 2008a).

The timetable system started in April 2008 on the university portal (Nakano et al, 2008b). We will show the system as a good example of collaborating several systems; SIS, LMS, Portal, SSO, IMS-capable web-based management tool (Nakano et al, 2008a). Each student has own timetable with clickable course names which navigate to the corresponding courses on LMS directly without re-authentications as shown in Fig. 8.

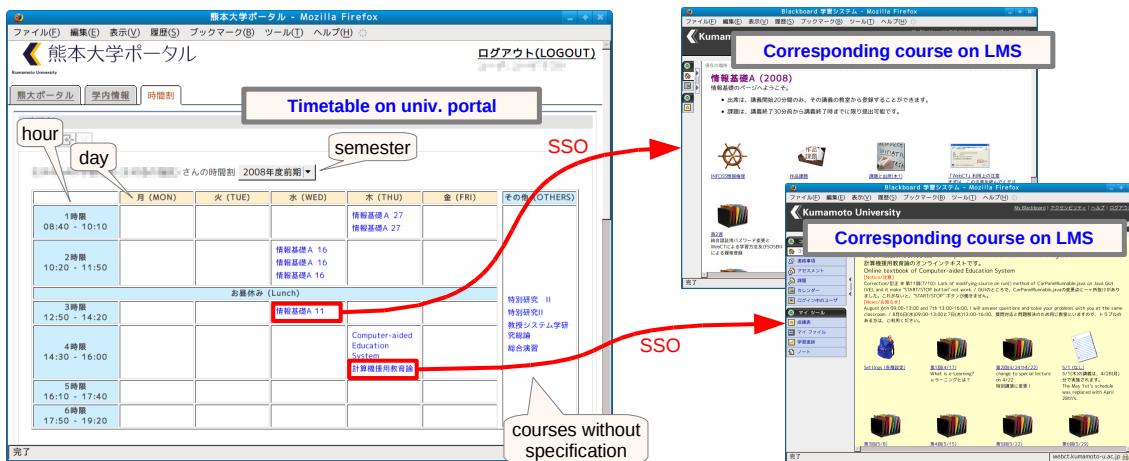


Fig 8. The timetable service on university's portal gives own course schedule for each person, where each course directly links to the course on LMS by SSO.

7. Summary

Along with our university's long-term ICT plan, the Center for Multimedia and Information Technologies was started in 2002, and the center introduced campus-wide LMS integrated with the SIS, and many types of courses, as ICT literacy for all new students, began in 2004. These experiences lead us to conclude that e-Learning professionals and campus-wide e-Learning supports are keys to improving e-Learning courses, both qualitatively and quantitatively. The Graduate School of Instructional Systems was established as the Japan's first 100% on-line program for e-Learning specialists in corporate and higher education in 2006. The Institute for e-Learning Development were established in order to accelerate e-Learning research and practices, including the role of campus-wide e-Learning support services, in 2007. These activities are bringing effective contents for distance- and blended- courses and integrated ICT-enhanced Learning environments.

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References

- Usagawa, T., & Nakano, H. (2005). *Campus-wide IT literacy education for all students by effective e-Learning environments*, Proc. 4th International Conference on Emerging Telecommunications Technologies and Applications (ICETA2005) [invited paper], Kosice, Slovakia, Sept. 2005, p.71–74.
- Nakano, H. (2004). *Highly IT-Based Learning Environment and e-Laboratories*, Proc. 3rd International Conference on Emerging Telecommunications Technologies and Applications (ICETA2004) [invited paper], Kosice, Slovakia, Sept. 2004, p.19-24.
- Nakano, H., Iriguchi, N., Sugitani, K., Kita, T., Musashi, Y., Migita, M., Matsuba, R., Ohta, Y., Gobayashi, T., Tsuji, K., Shimamoto, M., Kida, T., Usagawa, T., & Akiyama, H. (2005). *The Instructional Effects of On-line Tests on the Large-scale IT Courses*, Proc. th Information Technology Based

- Higher Education and Training (ITHET2005), Santo Domingo, Dominican Republic, Jul. 2004, p.F4B:7-11.
- Suzuki, K., (2007a). *From Competency List to Curriculum Implementation: An experience of Japan's first online master program for e-Learning specialists*, Proc. International Conference of Toward emerging instructional design theories and models for the future. Korean Society for Educational Technology (KSET) [invited paper], April 27-28, 2007.
- Suzuki, K. (2007b). *Learner-centered Design in Higher Education by ICT with IDT*, Proc. 8th International Conference on Information Technology Based Higher Education and Training (ITHET 2007) [invited keynote address], July 10-13, 2007.
- Nakano, H., Kita, T., Sugitani, K., Nemoto, J., Kitamura, S., Suzuki, K., Matsuba, R., Migita, M., Musashi, Y., Iriguchi, N., & Usagawa, T. (2007). *The Learning Portal for Improving the e-Learning Environment*, Proc. 5th International Conference on Emerging Telecommunications Technologies and Applications (ICETA2007), The High Tatras, Slovakia, Sept. 2005.
- Nakano, H., Kita, T., Sugitani, K., Matsuba, R., Migita, M., Musashi, Y., Iriguchi, N., Ohta, Y., Taira, H., Tsuji, K., Shimamoto, M., Kida T., & Usagawa, T. (2004, Japanese), *Data Synchronization of Learning Management-, Academic Affairs Information- and PC- systems*, WebCT user conference, No. 2, p.3-8, 2004.
- Nakano, H., Kita, T., Sugitani, K., Matsuba, R., Migita, M., Musashi, Y., Iriguchi, N., Kitamura, S., Nemoto, J., Tsuji, K., Shimamoto, M., Kida T., & Usagawa, T. (2006, Japanese), *Single Sign-On for WebCT CE4 / CE6 implemented by Servlet and Portlet with CAS*, WebCT user conference, No. 4, p.1-6, 2006.
- Nakano, H., Gobayashi, T., Sugitani, K., Kita, T., Usagawa T., (2008a, Japanese), *Developing the IMS-capable Web-based Management Tool for Registered Courses*, IPSJ SIG Technical Reports, No. 9, p.83-90, 2008.
- Nakano, H., Sugitani, K., Kita, T., Matsuba, R., Kubota, S., Migita, M., Musashi, Y., Iriguchi, N., Kida T., Tsuji, K., Shimamoto, M., Shimura, T., & Usagawa, T. (2008b, Japanese), *Developing the Web-based Timetable System Cooperated with LMS and SSO*, IPSJ SIG Technical Reports, No. 9, p.79-82, 2008.