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An Approach to e-Learning Aimed at
Knowledge Management

Motoi Fukumoto* Hiroh Yamamoto[†] Digoro Shiraki[‡]
Yasunobu Faujita** Seiichiro Sakaguchi^{††}

*Kyushu University

[†]Shinshu University

[‡]Hitachi Electronic Service Inc.

**Kyushu University

^{††}Kyushu University

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e-Technologies in Engineering Education Learning Outcomes Providing Future Possibilities

An Approach to e-Learning Aimed at Knowledge Management

Motoi Fukumoto, Kyushu University; **Hiroh Yamamoto**, Shinshu University;
Digoro Shiraki, Hitachi Electronic Service, Inc.; **Yasunobu Faujita and Seiichiro Sakaguchi**, Kyushu University

Abstract

In this paper, several new approaches to develop a new educational system aimed at knowledge management were introduced. These approaches include an engineering education using the e-learning system at Kyushu University, the development of e-learning training contents of the in-house training, and the introduction of e-learning in the public vocational training systems.

I. Introduction

In manufacturing industries, it is necessary to develop not only reliable products that meet the needs of the customers but also new products that make the customers willing to buy and satisfy them. For this purpose, integrated creativity in engineering, sociology, economics is indispensable for engineers. To cultivate and activate such creativity, new methods like “knowledge management” are now under study.

The human resources required in the manufacturing industries are not only engineers with high levels of expertise in a limited field, but also engineers with an extensive knowledge to cover various fields and with ability to solve a problem. In Japan, however, there are increasing number of engineers who neither show any interest in the social and natural phenomena nor actively absorb knowledge with a high motivation in recent years. These engineers are called “dependent engineers” because they cannot make decision on what to do based on their own judgement.

Based on a viewpoint of human resource development in Japanese companies, the image of required engineers is shown in Figure 1 [1]. As shown in Figure 1, the education of engineers is expected to develop their basic academic ability as well as to cultivate application ability of them. It is also noted that the education and training in universities and companies should be changed to correspond with the globalization trends of an information-oriented society supported by the high technology.

In this situation, the educational system and methods are forced to change because of the spread of the Internet and broadband communication lines that lift the constraint concerning “time”

and “place.” At many universities and enterprises, a new educational system based on an e-learning has been developed and is on trial [2].

The goal of education is not merely to provide knowledge but also to teach social trends as well as the principles of natural science and to cultivate the application ability of the learned knowledge. This paper reports three approaches undertaken to cope with the situation mentioned above. They are “a trial of engineering education making use of the e-learning system at Kyushu University,” “the development of learning contents for a corporate in-house training program,” and “an approach to introduce an e-learning system in the public vocational training.” These are all aiming at developing a new educational system for knowledge management.

II. An Approach to Engineering Education Using an e-Learning System

A. An e-Learning System

The key feature of an e-learning system is to be able to offer an opportunity for getting “knowledge and wisdom” from the best teachers to everybody of high motivation whenever and wherever they are. In order to realize an e-learning society, it is necessary to develop “a content making system” which enables teachers to make their own educational contents very easily. On the other hand, students want the delivery of a useful and easy-to-use educational content through the Internet.

In this approach, a cooperative e-learning system was constructed. The contents were made and composed of the teaching materials and the images of scenes in a classroom. The images, voices, and sounds were then simultaneously sent through the Internet to other sites. For this delivery, a two-way type e-learning system integrated with a learning management program, “Hitachi Performance and Learning Upgrade Support System (HIPLUS) on Web” (developed by Hitachi Electronics Service Inc.), was used.



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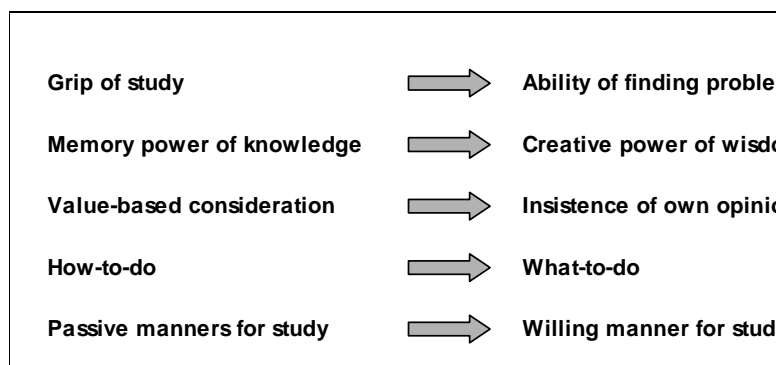


Figure 1. To cultivate engineers' application ability.

B. A Trial of Open Seminar

With use of the two-way cooperative e-learning system mentioned above, three series of open seminars, whose main theme was "system idea and knowledge management," were held for nine themes, as listed in Table 1. This trial was successful in delivering a face-to-face teaching seminar to other remote sites through the Internet and in providing content, which gave the students in the other sites an illusion that they were in the classroom.

III. The Development of the Educational Content for Corporate In-House Training

It was confirmed that the education using the e-learning system was more effective than the face-to-face education in getting better grades and reducing learning hours [3]. Aiming at knowledge management, companies have changed their conventional training system into an e-learning system. Moreover, they have started to develop new systems of the experience-type-learning and the cooperative-type-learning and use them. These two systems are thought to be effective for the development of business ability as well as creative ability.

Table 1. Program of open seminar.

Open Seminar of Kyushu University
Theme: System Idea and Knowledge Management

Session	No.	Subtitle	Lecturer
Nov. 19, 2001	(1)	What is the System thinking?	Dr. Eng. Sadamichi Prof. Doshisha Unive
	(2)	Linkage of Engineering and Business	Ms. Miyuki Ohba, In Environment and ene
	(3)	"Rice" of New Industry: Current State and Possibility of "System LSI" Design	Dr. Hiroshi Kawamoto System LSI officer, I Foundation for the A Industry, Science ar
Jan. 28, 2002	(4)	Recommendation of "Failure Study"	Dr. Eng. Yohtaro Ha Prof. Kogakuin Unive
	(5)	Actually Problem of Design Process Management	Dr. Eng. Yoshie Ma Hitach Ltd.
	(6)	Thought of Maintenance	Mr. Akihiro Yasumot Japan Techno-Econc
Mar. 1, 2002	(7)	E-learning and Community	Mr. Kazuaki Katori, I Director & CEO, NT
	(8)	Education of Practicing Design in Engineering	Dr. Eng. Masayuki M Prof. University of Tc
	(9)	Technological Education in Hitachi	Mr. Takao Terayama Senior Manager, Hit

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A. Experience Type-learning System (ETLS)

In the corporative in-house training, the education and training for each level has been done using various machines or equipment for practice, which inevitably cost enormous amounts of time and money. In this case, the experience-type-learning system (ETLS) is effective for the development of business ability since it clarifies the educational or training purposes.

As an example of ETLS, the LAN construction training system (LAN-CTS) is shown in Figure 2 [4]. With the LAN-CTS, after learning about the construction design, the users can simulate a LAN on the screen of the system.

The users set up the respective environmental condition for each piece of equipment. Then they connect each piece of equipment, and thereafter they can check whether it all operates properly. In case of a wrong connection, an error message is displayed and the operation hangs up as is true for actual situation. Moreover, the operation of signal transmissions is visualized, which helps the users to learn the protocols. The signal can be advanced step-by-step, which enables various levels of users to learn the construction design of LAN through ETLS.

The ETLS is very effective because the learners can enjoy studying with it as though they played a game. This kind of systems or contents will continue to increase from now on. However, it takes enormous number of the man-hours to develop such systems and contents. To solve this problem, the development of an authoring tool which makes it simple to create the system and content.

B. Cooperative-Learning System

Students learn not only from the content of the lecture itself but also through an interaction with other students. They learn something even by hearing others ask questions or by seeing others study hard. This kind of cooperative learning improves significantly their learning attitude and encourages each other.

As shown in Figure 3, this system enables the students to communicate and teach each other by voice or writing. On the screen of this system, there are photographs of the learners sharing the same teaching materials. By clicking on one of them, learners can communicate or ask a question to each other by voice or writing as well as with images. This keeps the learners from feeling lonely, and helps them to enjoy studying on the Internet.

IV. An Approach to e-Learning in Public Vocational Training

In Japanese companies, the on-the-job training and the supplementary off-the-job training have been given to employees in order to improve their skills [5]. In Japanese society where the birth rate is falling and elder people are increasing, manufacturing industries have partially shifted themselves into service industries. The companies need to be internationalized; therefore, they have moved their factories abroad. As the result, the manufacturing industries are running short of skilled workers and have a serious problem of the “hollowing out of skills” [6,7]. Also, because of the rapidly advancing information technology, companies want their employees to have a sufficient ability corresponding to the technology that make their business expand.

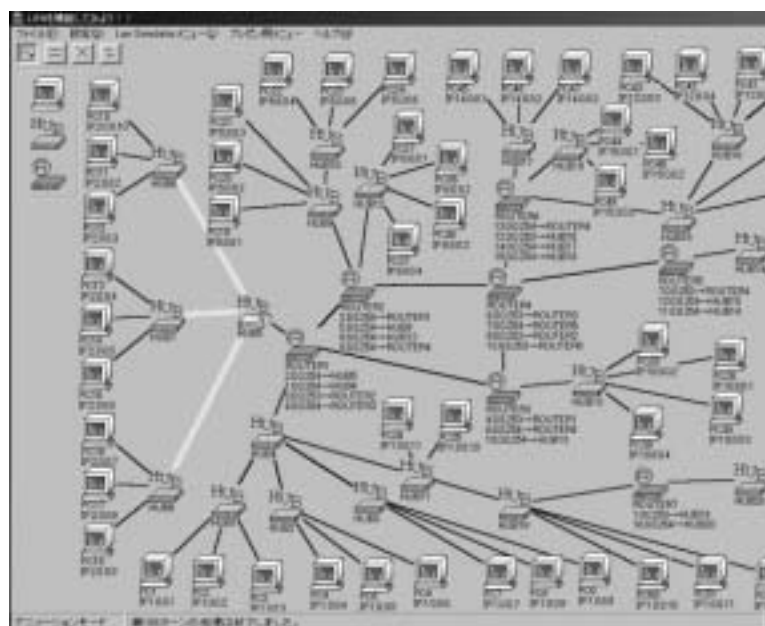


Figure 2. LAN Construction Training System (LAN-CTS).

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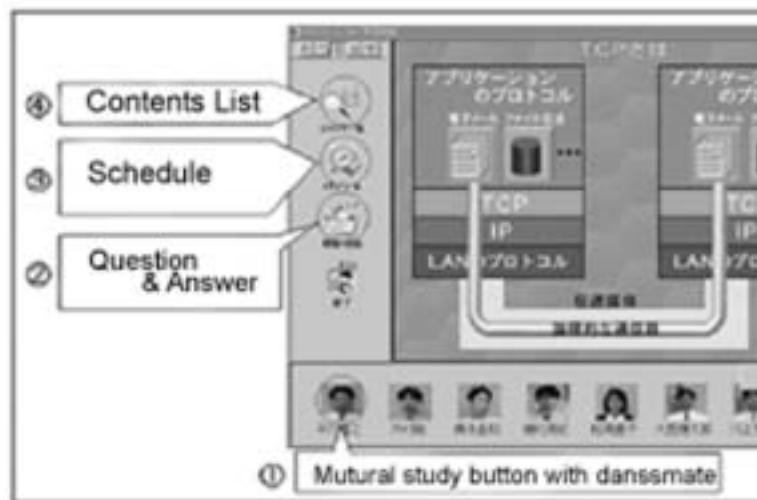


Figure 3. E-learning Cooperative Learning System.

To cope with this situation, the Japanese government launched “the IT Learning Support Project” in the year 2001 for a wide range of workers regardless of whether they are employed or unemployed. Recently, as a part of this project, a trial of the e-learning system was carried out nationwide so that many more workers could autonomously develop their skills.

The content of the IT-literacy education was sent over the Internet. The results made clear in this trial were the following.

- Ninety-eight percent of the monitors experienced e-learning for the first time in this trial. This means that the e-learning has just started in the public vocational training system in Japan.
- It is important to know the level of each learner and select the proper course of e-learning for them. For this purpose, a support system is desirable to give the applicants a test beforehand and determine their course from the test results.
- Seventy percent of the monitors were puzzled about the operation of the content, indicating that the development of a user-friendly content for the learners is desirable. In addition, by setting some easy exercises and not by setting a true-false question in each unit of the contents, the levels of proficiency and satisfaction of the learners will be increased.
- The monitors wanted sub-textbooks with an enthusiastic attitude toward e-learning. This is different situation from that in the conventional face-to-face education.
- Seventy-two percent of the monitors wanted to apply what they learned to their business. This was because most of the monitors applied to this trial were jobseekers or employees with a high motivation.

We are promoting the adoption of the e-learning system in the public vocational training. In Japanese industries, since highly skilled workers who have high levels of “expertise” and “techniques” are urgently needed, the development of skilled workers is an urgent problem in the current “hollowing out” situation of workers’ skills. The highly skilled workers should also have “wisdom” that makes full use of their expertise and techniques. If the “wisdom” can be developed with the content of the e-learning system, it would be the key to solve the present industrial problems. By analyzing the elements and levels of the worker’s accumulated “experienced skills” and “wisdom”, the development of the educational content mentioned above could be realized.

V. Conclusion

E-learning education is expected to be expanding by the recent trend of entering into the broadband ages. The e-learning system has boundless possibility for an ideal education by corresponding to the technology revolution. The conventional “face-to-face education in the classroom” would be drastically changed. The e-learning system could have the danger of creating some inorganic relationships between the learners. The fundamentals of education, however, on the one hand, depend upon the interaction of personalities. Since education does not only mean the acquisition of “knowledge,” the production of the content of a curriculum is needed, which arouses the learners’ interest.

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