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The Distance Ecological Model to Support Self/Collaborative-Learning in the Internet Environment

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Abstract: With the rapid development of information technology, computer and information communication literacy has become extremely important. As a result, teachers require new skills. A new teachers' education framework is necessary to enhance multimedia teaching skills and information literacy about the Internet environment. The purpose of this study is to propose and develop a Distance Educational Model, which is a School-Based Curriculum Development and Training-System (SCOUTS). In this environment, a teacher can learn subject contents, teaching knowledge, and evaluation methods of students' learning activities, related to the new subject called "Information", via an Internet based self-training system. In this paper, we describe the structure, function and mechanism of the Distance Educational Model, and then describe the educational meaning of this model in consideration of the new learning ecology, which is based on multi-modality and new learning situations and forms.

1. INTRODUCTION

Recently, with the development of information and communication technologies, various teaching methods using Internet, multimedia, and so on, are being introduced. Most of these methods emphasise, in particular, the aspect of collaborative communication between students and teacher during interactive teaching and learning activities. Therefore, now-a-days it is

extremely important for a teacher to acquire computer communication literacy (Nishinosono, 1998).

So far, there have been many studies concerning system development, which aim at fostering and expanding teachers' practical abilities and comprehensive teaching skills by using new technologies, such as computers, Internet, multimedia, and so on. In Japan, systems using communication satellites such as SCS (Space Collaboration System) are developed and used as distance education systems between Japanese national universities. In the near future, a teacher's role will change from text based teaching to facilitating, advising, and consulting. His or her role will be more that of a designer of the learning environment. Therefore, a teacher has to constantly acquire new knowledge and methodologies. We have to build a free and flexible self-teaching environment for them under the concept of "continuous education". At the same time, we need to build a collaborative communication environment to support mutual deep and effective understanding among teachers.

In this paper, we propose a Distance Educational Model, which is based on the concept of School Based Curriculum Development and Training System, advocated by UNESCO and OECD/CERI (Center for Educational Research and Innovation). We describe the structure, function, mechanism and, finally, the educational meaning of this model. It is necessary to construct an individual, as well as a collaborative, learning environment that supports teachers' self-learning and training, by using Internet distributed environments and multimedia technologies. A teacher can choose the most convenient learning media to learn the contents (subject units) that s/he desires.

2. DISTANCE EDUCATIONAL MODEL BASED ON SCOUTS

Until now, when a teacher wanted to take a class on "IT-education", s/he had usually to leave the classroom or school. However, it is now possible to learn various kinds of subject contents by building a virtual school on the Internet environment.

2.1 Distance Educational Model

Our Distance Educational Model is built on three dimensions. The first one is subject-contents, which represents what the teachers want to learn. The second one represents teaching knowledge and skills as well as evaluation methods of students' learning activities. From the third axis, a favourite

learning media (form) can be chosen, *e.g.* VOD, CBR, etc. By selecting a position on each of the three axes, a certain cell is determined. A cell stands for a "script", which describes the instruction guidelines of the learning contents, the self-learning procedure, and so on. Figure 1 shows the structure of this model. A more detailed explanation of each axis follows.

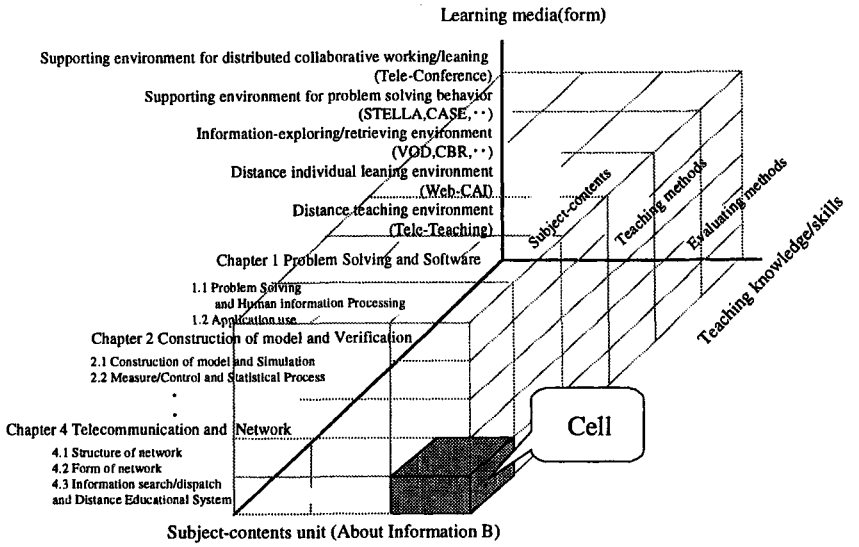

Figure 1. Structure of the Distance Educational Model

2.1.1 Subject-contents unit

In this study, we focus on the subject "Information", which is due to be established as a new obligatory subject in the regular courses of the academic high school system in Japan. The subject "Information" is composed of three sub-subjects, "Information A", "Information B" and "Information C". The contents of each sub-subject are as follows.

Information A: This sub-subject places importance on raising the fundamental skills and abilities to collect, process and transmit "information" using computers, the Internet and multimedia.

Information B: This sub-subject places importance on understanding the fundamental scientific aspects and the practical usage methods of "information".

Information C: This sub-subject places importance on fostering desirable and sound behaviour regarding participation, involvement and contribution in an information society. It focuses on understanding

people's roles and the influence and impact of technology in the new information society.

2.1.2 Teaching knowledge/skills

On this dimension, we have represented three items, which are: sub-subject contents, teaching methods and evaluating methods for "information" classroom teaching. The item 'teaching methods' stands for how to use and apply IT, in order to enhance a student's problem solving ability. This involves comprehensive learning activities, such as problem recognition, investigation and analysis, planning and design, implementation and execution, evaluation, report and presentation. We aim at teachers acquiring the proper respective evaluation skills of students' achievements, for each of the above activities.

2.1.3 Learning media (form)

This dimension represents five different learning environments: (1) "Distance teaching environment (Tele-Teaching)", based on one-to-multi-sites telecommunications; (2) "Distance individual learning environment (Web-CAI)", based on CAI (Computer Assisted Instruction) using World Wide Web facilities; (3) "Information-exploring and retrieving environment", using VOD (Video on Demand) or CBR (Case Based Reasoning); (4) "Supporting environment for problem solving", by providing various effective learning tools; and (5) "Supporting environment for distributed collaborative working/learning", based on multi-multi-sites telecommunications. Brief explanations for each environment follow.

1. *Distance teaching environment (Tele-Teaching)*: This environment delivers the instructor's lecture image and voice information through the Internet, by using the real-time information dispatching function via VOD (Video On Demand).
2. *Distance individual learning environment (Web-CAI)*: This environment provides CAI (Computer Assisted Instruction) courseware with World Wide Web facilities on the Internet.
3. *Information-exploring and retrieving environment*: This environment delivers, according to the teacher's demand, the instructor's lecture image and voice information, which was previously stored on the VOD server. For delivery, the function 'dispatching information accumulated on the VOD server' is used. In addition, this environment provides a CBR system with short movies about classroom teaching practices.

4. *Supporting environment for problem solving*: This environment provides a tool library for performance support based on CAD Modelling tools, Spreadsheets, Authoring tools, and so on.
5. *Supporting environment for distributed collaborative working and learning*: This environment provides a groupware with a shared memory window, using text, voice and image information for trainees.

2.2 "Cell" definition

The concept of a "cell" in the Distance Educational Model is quite important because it generates the training scenario, including information to satisfy the teacher's needs, the subject materials learning-flow and the guidelines for self-learning navigation. The frame representation of the "cell" is shown in Table 1. These slots are used when the system guides the process of the teacher's self-learning.

Table 1. The frame representation of the "cell"

Frame-name:		
		Slot-value
Slot-name	Learning objectives for a student	Subjects which should be understood Subjects which should be mastered
	Subject-contents	The unit topic
	Teaching method	The students' supervision method and instructional strategies
	Evaluating method	The students' evaluation method
	Useful tools	The software used for the training activity
	Operational manual of tools	The software operation method used for the training activity
	Prepared media	The learning media which can be selected
	Guide script	The file which specifies the dialog between the trainee and the system

3. OUTLINE OF THE TEACHER TRAINING SYSTEM

The system configuration of the teacher's training environment is composed of two subsystems based on the Distance Educational Model. One of the subsystems is the training system, where a trainee can select and learn the subject s/he needs, guided by the script in the "cell". The other subsystem is an authoring system with creating and editing functions for "cell" description. The users of the second environment are, for example, IT-

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