Practice of "WWW Online Class"

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March, 1997

Preface

The most fundamental and serious difficulty in the mathematics education is what is caused by learners' difficulty in understanding mathematics. "WWW online class" seems to me as a way out of the latter difficulty. Thus I am practicing it.

This article consists of two parts. In the first part, 'Reason of "WWW Online Class"', I will show the process where I deduced "WWW online class" as a break of the recent deadlock of mathematics education. And in the second part, 'Practice of "WWW Online Class"', I will show the contents of my practice and problems remained.

I Reason of "WWW Online Class"

1 "Tricking into Learning Mathematics"

1. 1 Unavailability of the Traditional Way of "Tricking into Learning Mathematics"

As one who makes a specialty of mathematics education, I regard the recent situation of mathematics education is of a kind of crisis.

The tendency of children's "leaving mathematics" is evident. It is nottrue that "leaving mathematics" is a new phenomenon. But there is a following characteristic in this case. That is, learners feel free to leave mathematics. They are free from the illusion of "It may be dangerous to stop trying to understand" that worked well before now to controll learners.

In fact, "leaving mathmatics" is worried about only from the standpoint of "looking over the future of the society (not of an individual)". It would be rare that an individual is retaliated in a serious way by her/his own "leaving mathematics" in the past. And one would not be anxious about her/his "leaving mathematics" if "leaving mathematics" is prevalent in the society.

By nature, mathematics is a tool for production. And because it is an excellent tool, it is made to be a school subject. Thus, if one choose a non-productive way of life, that is, if s/he decides to live as a consumer leaving the production to others, mathematics is no use for her/him.

Historically, educators have been manipulating such a discourse as suppress this fact. That is, "General Discipline". Indeed, a reason is required when people are made to learn mathematics, and this reason cannot be other than "General Discipline".

Surely, "General Discipline" is real. It is a fact of our physical system. But it cannot be explained by using language. If the style/quality of those who are excellent at mathematics suits the popular taste, people might become willing to accept this "General Discipline" though it is invisible. But, that style/quality is not such a thing as people wish for.

I declare : The reasoning of mathematics education by using "General Discipline" is not available now. Children of today are not tricked by this way of rationalizing mathematics learning.

1.2 Plain Reason of Mathematics Education

Let us take up the political point of viewing the education. Politically, a certain number of mathematical talents are needed in the society. And as for the members of the society, a certain level of intelligence which "General Discipline" brings up is needed.

Nobody determines her/his way of life before s/he lives her/his life.The readiness for the comming life is what results from the history of her/his learning. Therefore, a period of the "learning without purpose" is indispensable.

The function of mathematics is clear. That is, mathematics is a tool for production. And in order that one becomes able to use mathematics on a full scale as a tool for production, the experience of "learning mathematics without purpose" is required as a readiness.

Thus, the problem of mathematics education that ranks first for me is :

≪How can "learning mathematics without purpose" be accepted by children ?≫

And the answer is no other than the following, however impossible its content may be.

≪Making the "learning mathematics without purpose" be interesting in itself.≫

This is a "trick". But it is not what brings victims. In "learning mathematics without purpose", the learners experience "General Discipline" and grow up. This is beneficial for the learners. Conversely, if they are not "tricked", they might choose "leaving mathematics" and become disadvantage in the future.

In short, I am considering to do the following also in the mathematics education.

≪Letting children to eat not-good-taste but nutritious food by using tricks.≫

1.3 "Flattering Learners"

"To make learning mathematics interesting", this is the subject of my research in mathematics education.

Is it a "flattering learners" that I am going to ? Yes. But, this "flattering learners" is not a "doing what learners ask for".

Indeed, "what learners ask for" is generally a result. Learners cannot ask for what will appear in the comming lesson. In fact, learners react to those which has appeared in a way like "This is [not] what I was asking for".

"Flattering learners" that I mean is

"Developing what learners would accept in such an impression/emotion as "This is exactly what I have been expecting !"

1.4 Diversity of Personality

"To make learning mathematics interesting" cannot be "to serve what *all* of the learners think interest-

ing".

"What *all* of the learners think interesting" is impossible in the reason of the diversity of personality. And, anyway, we do not wish for such a thing. That concept only scare us.

Someone like/dislike close reasoning, someone like/dislike such games as flashes of genious are required, someone like/dislike visual expressions and someone like/dislike simple texts. There is no right and wrong. All should be present. But, we should not try to incorporate all into a thing. Those into which every liking of people is incorporated is not a food anymore.

1. 5　Kind of Learners I Target

In the subject of "flattering learners", the learners I target are of such a kind as follows :

- The world of a (mathematical) subject is not visible for them. Or, from the first, the concept of "the world of a subject" is lacked in them.

- They become interested in the subject if its world becomes visible.

- They feel happy if their understanding of the subject becomes successful.

Here, "the world of the subject becomes visible for them" means "they become to have the image of the subject".

2　Here Come Multimedia : Its Meaning

2. 1　Picture (or Image)

Traditional teaching/learning materials are texts. In the origin/base of a text there are pictures. But the text is not such a kind of thing that re-presents the pictures.

To reconstruct pictures from a text is a jump - a blind jump. Indeed, those who can, more or less, read a text are those who already has the pictures from which the text originates. (It is a tough work to describe this coffee cup in the form of text. And, even if I could finish it, nobody can re-presents this coffee cup from the text.)

If it is possible to serve pictures directly in the form of picture, that is the best.
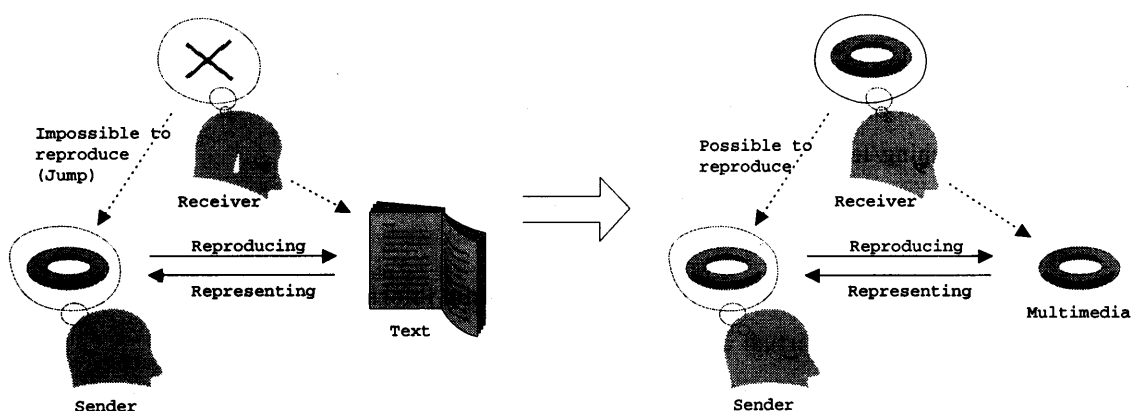
2. 2 Media Power

Such media as make us possible to treat "pictures" are what media I was wishing for. They should be very powerful. And luckily for me, here timely have come the "multimedia".

Multimedia are such media as make us possible to serve total images of things.

In the presence of multimedia, we cannot attribute the poorness of learning materials to the media, any more. The poorness of learning materials should be attributed to the poorness of learning-material-developers' talents.

2. 3 Personal Media

The most fundamental meaning of "multimedia" is "digitally-unified media".

In particular, "multimedia teaching/learning materials" are "digitally-unified teaching/learning materials". They are digital documents.

There would be many significances of digitally-unified-media. But the followings are the most important :

- Realizing both personal and very powerful media
- Convenient for information distribution

Those information expressions which were impossible to make without spending much money and labor are now reachable by a person in his private capacity, especially on a personal desktop.

For example, compared to publishing printed matters, there are following merits in making multimedia materials as digital documents :

- One can complete the whole process by oneself.
- Low cost and high quality
- Agreeably spacious layout

    (In the case of printed matters, "space is money". This is not the case for digital documents.)

2. 4 Information Design

In practice, my subject :

　　≪to make children wish for learning mathematics, by making the worlds of mathematical subjects
　　　visible for them≫

is "information design".

Indeed, "information design" becomes my subject in the following context :

- Teaching is giving informations
- Making teaching/learnig materials is making informations
- As for information, "understandable what should be understood" implies "of good-design/high-quality"

And today, the subject of "information design" is "multimedia information design." For example, presenting a total image by means of the virtual 3D.

Thus, I made it my business to design mathematical subjects (primarily, in elementary/secondary-school mathematics) in the form of visual image, by means of multimedia. And my standpoint in the research is "breakthrough in mathematics education by means of the new media power".

3 Here Comes Internet: Its Meaning

3. 1 Sending Information

Nobody intends to make such learning materials as is unlikely to reach people. If the stance of

≪to design mathematics in the form of visual image, by means of multimedia≫

holds, it is necessary that there is a way to send those multimedia contents to people.

And luckily for me, again, the Internet has timely come. There would be many significances of the Internet. And for me the meaning of the Internet is

"the media that allow anyone on the earth a quick access to the learning materials I made"

As for the ways of sending multimedia contents, the following three are major :

- Realtime digital presentation

    Displaying digital contents over a screen via a personal computer and a projector.

- Digital package

    Mainly CD-ROM.

- WWW pages

3. 2 WWW

"At one's own pace" is one of the important factors of learning mathematics. Students who can realtimedly follow a mathematics lesson, at least except the elementary school mathematics, are scarce. We could say they are peculiar. In order that one can understand a mathematical subject, one should be guaranteed sufficient time for consideration, together with well designed learning materials.

Internet technology brings us an environment where we can realize the "learning at one's own pace". That is, WWW.

Among such digital learning materials as one can learn at one's own pace, espetially repeat a hard point over and over, the most important are the CD-ROM and the WWW page. And each has advantages and disadvantages of its own.

For learners, CD-ROM is preferable to WWW pages from the point of contents quality. But in the case of CD-ROM, the interactivity is within the program. It is impossible for learners to ask a question and get an answer interactively (that is possible in the case of WWW).

For contents makers, WWW pages are much easier. In the case of CD-ROM, one is obliged to public the content in a perfect style to some degree. But, in the case of WWW pages, because the modification and the renewal are possible at any time, therefore one can start from the small and gradually increase the contents. Instead, file size of the contents is restricted to be small.

3. 3 Utilizing Account-Set

Because the information dispatching by WWW page is of the form of "others access here", it is possible to classify learners minutely by using the authentication-setting of WWW page.

That is, for each learning class a login ID/password is set, and it is announced to learners. The identification of the learner is done by e-mailing to her/him.

In this way, kinds of off-site (asynchronous) education are realized. At-home learning, on-the-job (recur-

rent) training, lifelong learning,etc.

3. 4 Difficulty of Realtime Remote Class via Internet

It is impossible to do the realtime online instruction via Internet, in today's situation where communication packets are crowded heavily.What is expected as a breakthrough in the traffic is the "applying satellite communication to the Internet communication".

For the time being, the realtime online class is only practical by using a private line. By the way, public telephone line used for an online class is a private line, because the line is private while the connection is made.

4 Strong points of "WWW Online Class"

4. 1 Learning at One's Own Pace

It is difficult to pause or return a stage of a realtime instruction.Indeed, if learners would start pausing or returning on their convenience, the traditional class does not hold.

The traditional scene of the lecture of mathematics is such that learners are busy in copying what is written on the blackboard into their notebooks. Naturally, in them remains no room for understanding.Yet, even if they stop taking notes and try to listen to the lecture,words simply pass away.

Those who can realtimedly follow the matematics class is very scarce and of a special talent. Most of the students irritate, feel pain, be in despeir, or be in anger at the mathematics class.

Moreover, it is physically difficult to listen to the lecture in concentration. There is a statistic saying "at most 20 minutes".

The online class on WWW is off-realtime. Learning at one's pace is possible. There is no time limit for learners to clear hard points and to reach understanding a subject

By the way, the meanings of the "on-site class", when compared to the "off-site personal learning", are :

- Giving to students a place for their self-realization. (Self-realization is a result of the process of relativizing self with respect to others.)
- Making learners become to understand the subject intuitively.
- Motivating/orientating students to learn
- Presenting a exciting display of the digital contents, which is impossible on the desktop of the personal computer.

4. 2 Wherever, Whenever

Online learning is possible

- wherever an Internet terminal machine is present,
- whenever one can access by an Internet terminal machine.

The Internet is now in the stage where people begin to get there own terminal machines. It is a problem of time that Internet terminals will be as prevalent as telephones are now. And it is the time when the "wherever and whenver" is truly realized in the learning.

4. 3　Learning Materials of Good Quality

To say from the standpoint of instructors, it is very difficult to present learning materials of good quality, in the current situation.

In the case of blackboard, giving complete expressions or fine pictures is impossible. This is same for OHP because of the way it is used (simple presentation where attendants' intuitive understanding is expected). These problems are solved in the way of giving printed matters to each student. But the most appropriate expression for explaining mathematical subjects is the animation.

Because the resolution of the TV monitor is low, expecting the explanatory animated expressions of mathematical subjects is too much. The combination of a high resolution projector and a big screen allows us to share the contents in the personal computer, and this is a big progress of the situation. But the limitations of the "simultaneous class" remains in the form of "cutting off private conveniences of each learner".

Compared to these, in the case of the Internet online class, we can aim at progressing teaching/learning materials in the form of "multimedia materials" and "personal and interactive learning materials".

Ⅱ　Practice of "WWW Online Class"

1　Lectured Subjects

I began my online classes with "SecondarySchool Mathematics" and "Special Lectures on Mathematics Education I" in 1996, Fall. (*http : //m. iwa. hokkyodai. ac. jp/class/*)

In the case of my campus, the foremost problem in practicing online classes is the students' environment for accessing network, espetially the number of terminal machines which students are allowed to use. And on this point, my campus is on the way to enriching facilities.

Thus, only those subjects that satisfy the following conditions could be made onlined :

・ Small number of attendants.

・ Each attendant belongs to such a department where the network environment is comparatively good.

And, among the subjects I teach, those which satisfy these conditions are "SecondarySchool Mathematics" and "Special Lectures on Mathematics Education I" mentioned at the beginning.

2　Preparation of Contents

2. 1　Case of "Secondary Mathematics Education"

I had been practicing to make multimedia (digital) teaching/learning materials for years. At first, I intended to prepare contents for my future realtime digital presentations and CD-ROM titles.

Those contents are visualizations of the subjects in the elementary school mathematics. They were made from the stance of

"Looking at the elementaray school mathematics from the high standpoint of mathematis".
The targets are not elementary school children, but students in teacher-training colleges and teachers-on-the-job. The contents covers almost all the subjects in the elementary school mathematics.

These contents can be applied to the teaching/learning materials of the secondary school mathematics, because the subjects in the secondary school mathematics are fundamentally the same as those of the elementary school mathematics. So, the rest of those which I should do was to modify contents and to add some of new contents.

2. 2　Case of "Special Lecture on Mathematics Education I"

I have been developing, in WWW pages, illustrated discourses on "informationalization of mathematics education". And I appropriated them to the learning materials of "Special Lecture on Mathematics Education I".

3　Campus LAN User Account as Requirement for Application

In my plan of "online class", the application for taking lectures, the reception of reports, the notification of the results, etc. should be of on-line. So I made it the requirement for attending the classes that they have user accounts of the campus LAN.

To those who wish for the application and do not have accounts yet, I did an orientation class and then registered them as campus LAN users, in the manner the campus LAN committee determines.
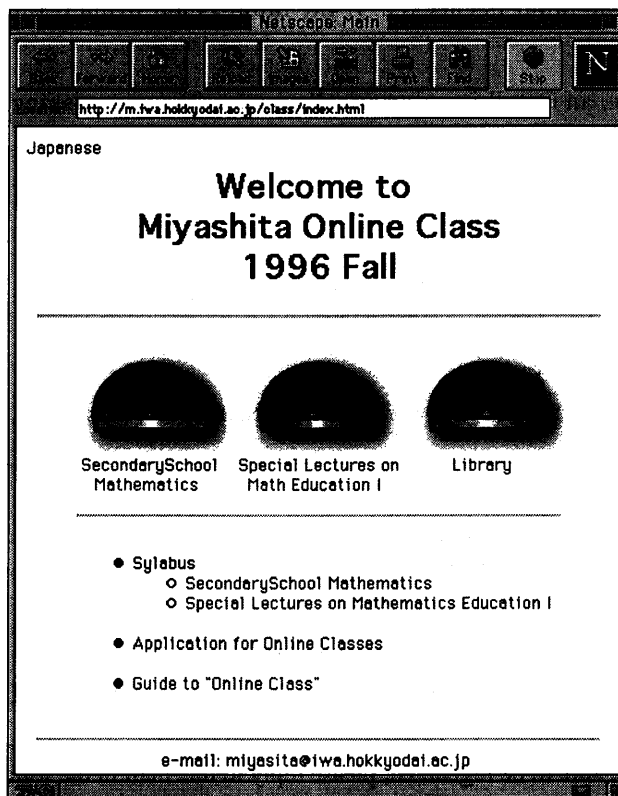
4　Structure of "Online Class" Homepage

4. 1　Frontpage

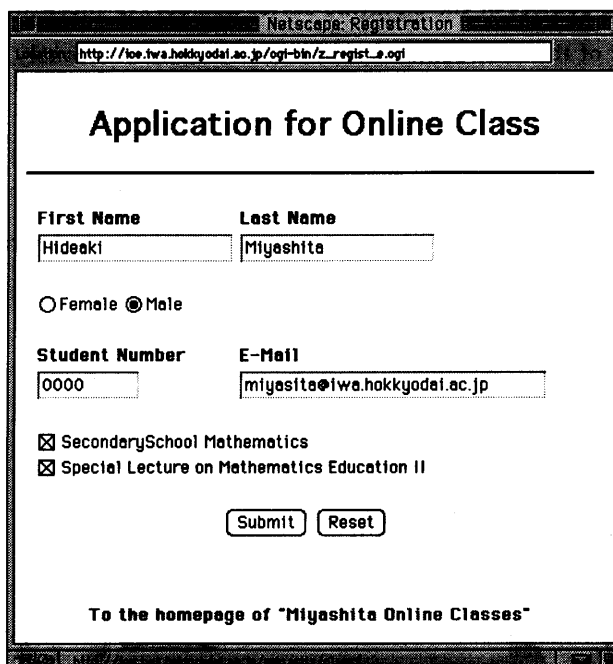The frontpage contains the followings :

- Entrances to virtual facilities
- Syllabi
- Application window
- Guidance for taking lectures

Students are to check the syllabi, read the guidance, and then go to the application.

4. 2 Application for Taking Classes; Registration

The application for taking lectures is done online, that is, input forms in WWW pages are used.

First, the adequacy of the input is checked. If the input is not proper, the user is prompted to input again.

If the input is acceptable, an e-mail is automatically sent to the user, asking if s/he is sure. (This is for the identification of the user.) And on the display of WWW browser, a new pag eappears announcing that an e-mail was sent.

The content of the mail:

Mr. Hideaki Miyashita
I received your application for **Miyashita Online Class** as follows:

Name	: Hideaki Miyashita
Sex	: Male
Student Number	: 0000
E-mail Address	: miyasita@iwa.hokkyodai.ac.jp
Classes	: SecondarySchool Mathematics
	: Special Lecture on Mathematics Education II

If you are sure to be registered, please reply to this mail in the following format:
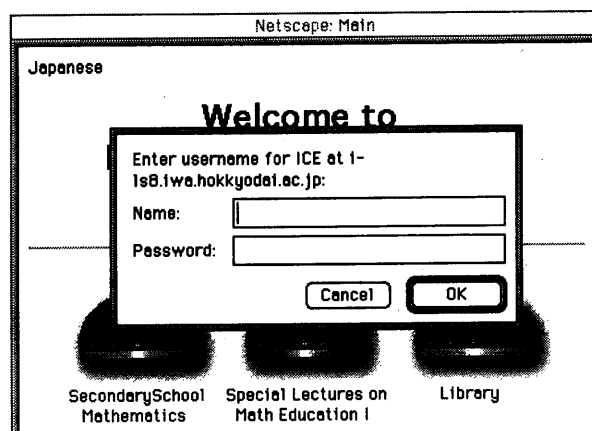
1. Subject is 20574
2. Write no message

These steps are realized by using a CGI program.

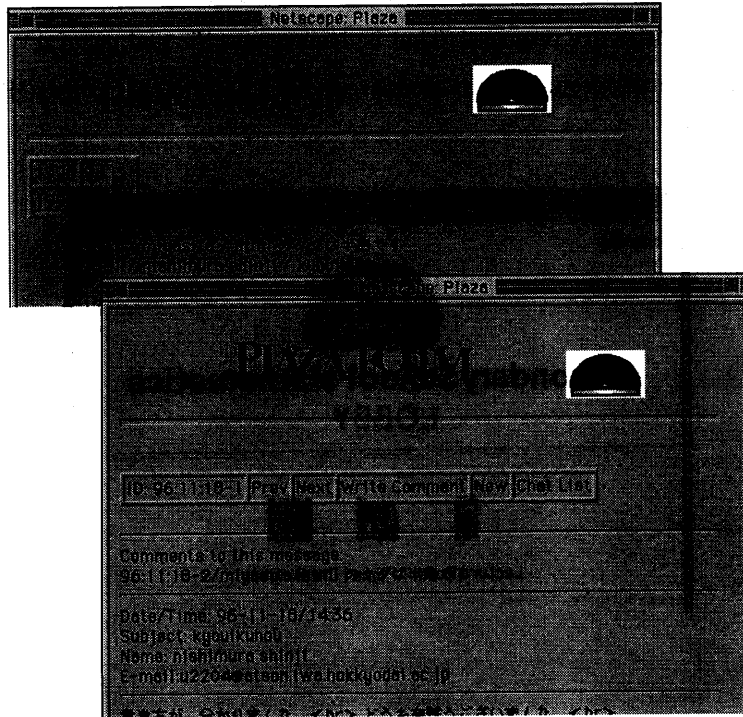If a reply mail comes, the subject of the mail (the serial number) is checked. If it is proper, the entry of the sender is made in the list of the attendants of online classes. Simultaneously, a reply mail is sent, giving the user ID and the password for entering classes.

4. 3 Login

Before one enters the virtual facility of a lecture, one must pass the authentication by inputing the user ID and the password in the login.

4. 4　Virtual Facilities

4. 4. 1　Lecture-Specific Facilities and General Facilities

Two kinds of virtual facilities are prepared. That is, lecture-specific and general.

The lecture-specific facilities prepared this time are lecture rooms, chat rooms("Plaza"), and classmates lists.

It is the library alone that is prepared this time as a general facility. Indeed, the general facilities are such a kind of things as are requested when "virtual classes" grow up to a "virtual university".

4. 4. 2　Lecture Room

The "lecture room" is a set of learning materials structured in the form of hypertext.That is, links of WWW pages.

4. 4. 3　"Plaza"

A set of pages in the form of an electric conference is prepared for the following uses :

　　　　• Information/notice/notification

· Questions and answers

· Chat room for participants


4. 4. 4 Classmates List

In order that the participants can know their classmates one another (with e-mail addresses), the page of the list of classmates is prepared.
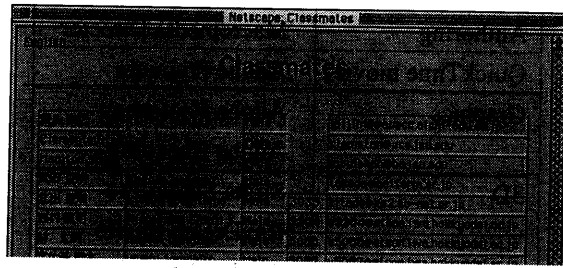
5 Multimedia Contents

Digital files of following formats are made as multimedia contents, and pasted in WWW pages :

Still Picture	GIF
	JPEG
Animation	Shockwave movie
	QuickTime movie
	Java Applet
	GIF Animation
Audio	Sound
	MIDI
	RealAudio
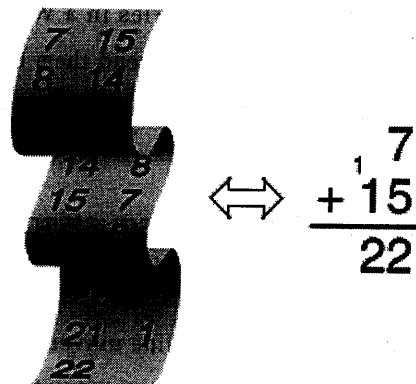
The machine for the contents making is Macintosh, and the applications are mainly as follows :

Authoring	Macromedia Director
QuickTime movie	Adobe Premiere
Graphics	Adobe Photoshop
	Adobe Illustrator
3D	Strata Studio Pro
	RayDream Studio
	Adobe Dimensions
	Swivel 3D
	Bryce
MIDI	Vision
	Overture
Sound	SoundEdit 16
RealAudio	RealAudio Encoder

6 Examination/Evaluation

One of the foremost problems in practicing online classes is the evaluation of students' class achievements.

Possible ways are as follows :

- Giving a subject, and letting students send their report by e-mail or ftp.
- Giving a quiz, and letting students answer by using input forms in WWW pages
- Evaluating students' performances in the chat room.

At first, I planned to prepare students' home directories in a WWW server machine. Students would make their reports in the form of html document, and would send them by ftp. But this derives the problem of the server/network security. I could not solve this problem in time, and shelved it.

7 Problems Remained / Topics for Further Discussion

7. 1 Linkage with Database

Foreseeing that "online class" would develop into "online university", I am planning to add a database to the system (generally, "constructing an intranet") so that the storage of followings become possible :

- Students' data
- Students' class achivements/performances
- Multimedia contents
- Quiz/exercise/examination
- References

7. 2 Ways of Submitting Reports

I pursuit the following way :

≪A student submits a report as WWW pages; where s/he, by her/himself, ftps the component files

into her/his home directory in the server machine.≫

The reason why I stick to this way is :

- in the case of the e-mail, it is impossible to make hypertexts, and to make visual expressions though there is a restricted way (that is, attaching binary files).
- in the case of using the input forms in WWW pages, it is impossible to identify who submitted.

On the other hand, if students are allowed to ftp and to read/write files in the server machine, there occurs the problem of the server/network security. In order that "submitting reports by ftp" is realized, this problem must be cleared.

7. 3 Enrichment of Virtual Facilities

This time, though I started with facilities of minimal scale, I did not recognize any insufficiency of facilities.

But as "online class" develops, it would be required to introduce such facilities as correspond to "catalogue", "curricula", "schedule", "notification", "school achievements", and so on.

7. 4 Environment for Accessing Network

The foremost factor on which the success/insuccess of the "online class" depends is the environment of network access. It is the most important that students are always close to terminal machines. In particular, a sufficient number of terminals should be prepared. The best is such that a sufficient number of terminals are set in lobbies and libraries of the campus.

As is often said, "it is the worst to keep the computer room under lock and key". But it is our existing state that, because we have only a small number of computers, we are obliged to allow students to use machines-for-our-research as network terminals. We are afraid that the resources in those machines are destroyed. So, we are apt to manage the general use.

Indeed, before the informationalization of education we must clear the problem of completing the environment of network access, that is, keeping a enough space for the terminals in the rather small site of the campus, preparing a sufficient numberof computers, and accordingly upgrading the LAN network, etc. But it is the saving that this problem is not of the technology but simply of the money.

7. 5 Preparation of Variety of Options

As I said at the beginning of this article, "WWW online class" did not come in me from "What can I do by using Internet/WWW". I need it as a way to make a breakthrough in the mathematics education which is now suffering in learners' difficulty in understanding mathematical contents, and their "leaving mathematics".

In my thought, this "breakthrough" is done by realizing easy-to-understand learning materials, and this "easy-to-understand" is realized by the way of "visualizing mathematical subjects".

Then, very timely for me, came "multimedia" and "Internet" (in particular, "WWW").Their meanings for me are "the media that enable me to visualize mathematical subjects" and "the way of sending multimedia learning materials to learners", respectively.

In this way, the idea of "making breakthrough in mathematics education" was my starting point. And "WWW online class" is one of the options which would be applied when we intends to solve the problem by

the way of "informationalization".

In subjecting "making breakthrough in mathematics education", it is important to accept a variety of options from the standpoint of "the right option in the right place". And in this understanding I have been keeping the followings to be my subjects of practice, too :

· "Realtime multimedia presentation"

· Televised video instruction" (Especially, applying the satellit ecommunication.)

and in the meanings of

· A multimedia version of the traditional instruction

· A wide-areal version of the traditional instruction

respectively.

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