Conforming a teacher-training course to new concepts of well-being

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Abstract

The Japanese system, once worked well, has been weakening. It is required to correspond to the situation, while shifting to a new style of social infrastructure and new concepts of well-being. In the field of education, this subject is to conform existing courses to new concepts of "ability/trait for well-being (as producer/consumer)". And it is important especially in the case of teacher training course, because those who are to educate others for well-being must have ability/trait for well-being. From this point of view, is focused a type of ability/trait which is apt to be expressed "designer's". We have been inquiring into and practicing "designer raising" in our teacher-training college. One of the conditions to be satisfied to maintain the courses is a system which brings a high efficiency in the course-management, whence staff become possible to reserve energy for undertaking the course. We made this system web-basedly, together with a self-learning system.

1. Current Social Situation in Japan

1.1 End of Japanese Style of Management/Labor

The lifetime employment system together with the seniority wage system has been the Japanese traditional management/labor system. Workers take jobs with an employer following their schooling and continue with that employer until retirement age, while gradually getting promotions and pay raises. In this system, companies don't recognize previous work experience when workers switch jobs. Thus few people change jobs.

It is almost composite to the Western system, where companies reduce personnel when business is poor and employ personnel as needed when they expand operations or enter a new field, talented people are promoted faster, and changing companies is a common way of climbing the corporate ladder.

This Japanese system has been weakening. The lifetime employment system and the seniority wage system are beneficial when the company enjoys steady growth and there is not much variety in work contents. But now, growth has slowed, and production and sales aren't rising steadily. The company was forced to dismiss longtime employees who had high salaries.

Japanese companies has started restructuring their traditional systems. The subjects are reforming the structure of the management system, shutting down unprofitable areas, putting emphasis on per-

sonnel ability and performance, reducing the number of high-salaried management posts, and so on.

And here also appears a shift in consciousness of the Japanese work force, which is favorable for this tide. People no longer have a negative image of switching jobs. The desire not to be tied down to one particular job has been spreading. (In this background, there is the fact that economic prosperity has created a social foundation upon which people can even live on their earnings from part-time jobs.)

1.2 Population Size/Composition

Japanese society continues to age. It follows from the drastically reducing birthrate and the increase of the number of unmarried people, both of which are related to the shift of consciousness and, therefore, make the problem serious.

Decrease of the number of children brings many problems, some of which are: changing family patterns, labor shortage, age support which heavily burden productive generation.

1.3 Restructuring

For Japanese, it is the time of fundamental restructuring now. Streamlining the organization is a structural problem, for the government, companies, education organs, and the others. Especially, the system must change to be in conform to the global standard. Indeed, the international competitiveness of Japan has been weaking in many fields.

1.4 Individualization/Diversification

Japan has been shifting, more and more, to an individuality/diversity-oriented society, with people's changing consciousness about labor/job, promotion, prosperity, happiness, value, etc. Some of the factors of this trend are:

(1) High economic achievement, followed by changing consumption patterns, increase of free time.
-- Japanese society has already achieved stable economic growth, and people are turning from material prosperity to personal fulfillment. For example, the public becomes less focused on general goods and demands items which suit individual tastes. Some young people prefer being free-timers to having permanent jobs. (Going from one part-time job to another, this group chooses free time and hobbies over work.)

(2) Expansion of service-oriented economy (shift from product-oriented to service-oriented), which follows from (1).

(3) Changing employment/working/schooling patterns.

(4) Changing family/community patterns.
-- Although family members live under the same roof, each member lives a completely separate schedule.

(5) Informationalization, personal media.
-- IT/ICT extraordinarily extends our personal power. It breaks the limit of the individual.

2. "Well-Being" in New Stage

Here we use the word "well-being" to mention *a phase in one's life which one feels satisfied*. (Unsatisfactory definition? No. The *language-game* of "well-being" is exactly it.)

The judge of "well-being" depends on each of us. But here we assume that our way of using the word is, in a given common situation, mostly similar to the others', whence we can say of the goal of human communities in this way: "the goal of human communities is the well-being of present and future generations".

There are many "well-being". Here let us focus on the followings -- they should become marked in such a situation as we are facing now, transitional to a stage which is, from the view point of technology, drastically new :

(1) Learning

In the case of youth, "success at school" accounts for most of "well-being" about learning. Indeed, it effects on person's succeeding stage, that is, maturity. Youth should, especially, develop positive attitudes toward achievement, and ability to continue learning throughout life. In the case of adult, who confront with problems under economic and societal pressures, need to be comfortable to acquire new knowledge and skills for solving problems.

(2) Adaptation

Adaptation to the informationage (information-oriented society)

-- Extension of person's ability (in particular, physical function) by importing IT. Good use of IT for producer/consumer activities (information strategy). Adaptation to new media. Making digital contents, dispatching information, net group working.

Adaptation to the diversification of working patterns

-- Career-up. SOHO. Applying human resource business (personnel agencies).

Skill-up, self-development, self-realization

(3) Design

Able to design, creative (creating a culture), productive, positive toward achievement, taking initiative, independent. Specifically :

Ability to shift difficulties to chances : Effectively strategic toward the situation (especially, such situation as the restructure of the "existing" and the destruction of the "constraints" take place). Intending and practicing the globalization of the activities. Achieving superiority by using differentiation-strategy. Efficient functioning, optimization, restructuring.

Good use of material : Having detailed knowledge of material (science). Receptive to material, that is, sensitive to its possibility/potential.

3. "Designer" - Personal Trait/Ability Needed in New Stage

Japan has been struggling to improve its standard of living and its superior position among the countries of the world. Today, however, it has declined into a structural depression and is trying to go through by restructuring its traditional systems which have become out-of-date.

One of those on which its success depends is the education, especially the one for today's youth who will be the leaders and the citizens of tomorrow. Japan is committed to preparing young people for

their challenges and, therefore, to improving education.

The demands today's educators are responsible to answer are those of a changing/challenging society. In the preceding section, we showed "abilities required to be well-being in changing/challenging society". They, one of which is "trait/ability of designer", become the goal of today's education. (Here, "changing/challenging" means: "not allowed to be peace in the existence, obliged to develop a new direction", "disadvantage changes to advantage", "business chance calls at newcomers", "the seeds from which our future grows are pursued".)

We use the word "designer" to express, ideally, a person who can do "designing a total solution", for which the following traits/abilities are required :

-- To see a matter in perspective. Introducing structure/frame/module/flowchart ("from global to local"). To simulate a solution with strictly logical calculation. To do effective presentation. To use IT in a best way toward the given, as infrastructure/tool for work, realizing high quality and remarkable effectiveness.

"Designer" implies "good problem solver". A designer, as an inquisitive, investigative person, seek to identify needs and seek innovative solutions. In idea development process, a designer collect, analyze and interpret facts, while realizing her/his own adaptation and progress. Intuition and imagination must be paired with technical skill. Indeed, it is a designer's trait required for conceiving a product-out which is sound, working, and welcome.

4. Relation between Design and Mathematical Ability

In a preceding section, we argued that a "designer" is a "problem-solver". And the "problem-solving" of this sense is well-suited to "mathematics" -- this conformity is well-argued in the form of "mathematical problem-solving". Thus, the subject "mathematical sense/ability as designer's trait" holds.

Indeed, mathematical sense/ability is one of the most important elements of designer's trait, in the following sense :

-- Analyzing, clarifying, simplifying, organizing. Keeping to logic (being consistent/reasonable). Structural way of thinking, viewing, processing, expressing, representing, communicating. Schematic. Frame/module -oriented thinking. Functional thinking. Numeral calculation. Calculus of logic (operation, inferring, reasoning). Logical design. Using techniques of geometry. Programing. Simulation. Visualization. Using diagram/graph. Freely thinking. Adaptive to contents-free. Adaptive/flexible to logical machines/systems such as computers, network systems. Developing very special skills which are used in devising solutions to complex problems. Versatility.

And in a world increasingly globalized and dominated by technology, mathematical knowledge and skills become more and more important and central to the ability/competency.

The range of design on which mathematics is engaged is wide. The points of contact between design and mathematics are showed by the following matrix :

Works-Mathematics Matrix

	Fields/Range of Mathematics
Fields/Types/Aspects of Work	Practices (Appearance of Designer's Ability)

Works : Design (Grand design, Information design, Communications design, Media design, Architectural design, Curve and surface design, Lighting design, Engineering design, Industrial design, Projects design), Planning, Programing, Visualization, Simulation, Exploration, Research, Modelling, Presentation, Representation (graphical, digital, sculptural, musical), Computer graphics, CAD, Animation, Music, Cinema, Virtual reality, Fine art, Sculpture, Ornamental styles, GIS, Using design tools, Operation of logical machine/system, Instruction/learning, etc.

Mathematics : Set/Logic, Function, Geometry, Algebra, Linear algebraic geometry, Calculus, Probability/Statistics, Fractal, Graph theory, Mathematical software, Miscellaneous (ratios, proportions, scales, symmetry, similarity, harmonies), etc.

5. Setting up the Subject of "Mathematics Course for Designer Raising"

5.1 Reason of "Mathematics Course for Designer Raising"

We are facing a highly individuality/diversity-oriented society to come. In this new era, our way of living deeply depends on our ability for being positive and independent, preparing for what to come, and creating our own solutions for new types of problems. Not floating in the flow of individualization/diversification, but grading one's own personality up by making "differentiating oneself from others" a strategy -- This becomes an image of "establish one's independence" in the era to come.

Correspondingly, as for education, the discipline for nurturing this type of ability becomes a promising item for "sale". Let us express this ability as follows:

Ability for the good producer : Creating/developing a "well-being" for the people

Ability for the good consumer : Creating/developing her/his own "well-being"

And the course for nurturing this ability can be called "design course" in a broad sense. We characterize the "design course" as a course where the study on "well-being" is properly realized, and, in this sense, we inquire into the nature of the "design course" and the way of realize it.

5.2 Vision and Mission of The Course

A traditional way of characterizing a course/university is to apply categories or standards which are academically proper. Against this, we characterize our “design course”, that is “mathematics course for designer raising”, as "a space where new wave is continuously and lively spouting (fashion space)". The output of the course is an individual/personality who can adapt her/himself well to the situation by

using her/his mathematically-strengthened ability.

5.3 Ability to Be Disciplined

The (general) ability which we are to discipline, as the goal of the course, is the following :

(1) Ability for being designer

Receptive to material. Analyzing/understanding material. Designing appearance. Receptive to product-for-sale. Receptive to consumer. By using digital tools, making a work efficient, improving the quality of the outcome (computer/net literacy). Creative, keeping to be original.

(2) Ability for being good producer/trader

Receptive to business (production/trade). Achieving a "product for sale" as the outcome of work. Commercial strategy in the era of individuality/diversity. Receptive to corporation management. Foresighted/farsighted. Information strategy. Competency. Endurance.

(3) Ability for being good consumer

Receptive to material with knowledge. Strategic use of product.

For this, we especially focus the following learning experience:

Using tools (information tools, digital design tools, mathematics). Practicing to be designer (information designer, project designer, life-style designer).

5.4 Method for Designing The Course

In colleges/universities, we see mathematics education placed in a course such as : specialized course, teacher training course, general education course, basic course. And in every case, traditional (that is, academic) way of teaching mathematics is generally weak to take the stance of "making students understand soundly the application/usage", that is the stance of "mathematics as tool". There "story" lacks, therefore students cannot have a course, objectives, or a goal-vision, of studying mathematics; in short, they cannot learn mathematics. (Because mathematics is, in nature, content-free, teachers must be especially careful about telling/showing clearly : "where you reach finally", "what it is for", "what you are doing now", "what you are to do next") And such non-integration of the curriculum, where mathematics and each are treated as either or as polarities, causes students to be at a disadvantage when it comes to making intelligent decisions toward problems of daily living.

We introduce and design our course in the following way:

(1) Each class is organized in the style of : story-drawing, achievement-improving, and problem-solving. Mathematics is introduced as a set of practical tools -- that is, it is not posed/taught with the appearance of "basic knowledge", "pure mathematics".

(2) It is aimed that the learner becomes to understand the significance/value of each subject in experience of using tools properly in works. Indeed, this is the essence of mathematics-understanding.

(3) In the style of "improving skills for using tools", the learner enters the stage of deep understanding of mathematical contents and of extending the domain of application. Thus the class is truly a mathematics class. (The story-drawing-style instruction must not be negligent of mathematics instruction.)

We know well, from our own experience, the difficulty of this teaching method. There, planning of teaching must be most careful. (In order to make the instruction to be "story-leading", it is required to introduce "integration of different fields", "spirally ascending the steps of course", and so on.) An exemplary laboratory environment characterized by research, innovative teaching, and service is required. And teachers must develop themselves to proficiency in the sense that : they know/experience well the joy of discovering and forging connections within and among mathematics, science, the arts, and the humanities. How it is difficult is implied from the fact that the tenor of arguments in Yearbooks of NCTM (National Council of Teachers of Mathematics, USA) has been changing between problem-solving-oriented and basics-oriented, in about 20 years cycle.)

Story-Mathematics Matrix

	Mathematics
Stories	Classes (Instruction/Learning)

5.5 Elements of Course Design

A way of inquiring "mathematics course for training designer" may be the one that uses "course", "student", "faculty" and "facility" as prime elements/factors, in such a manner as fallows :

(1) Course

Subjects : Mathematical subjects. Information design. Material. Representation, display, expression. Simulation. Technology. CG. Server-system. Tools. Page-making, etc.

Learners ability/trait to be aimed at :

General Ability : Knowledge. Skill. Attitude, intention, disposition, belief. Sense, perception, reception. Foresighted, farsighted. Competency. Endurance. Tolerance. Adaptation. Strategy. Demonstration, presentation. Inquiry, exploration. Curiosity. Soundness and relevance of information and reasoning. Think essentially, simply. Construct questions. Use appropriate technologies, etc.

Ability for making business : Knowledge, understanding about trade (industry, etc.), "product for sale". Commercial strategy. Corporation management. Information strategy, etc.

Ability for the good consumer : Knowledge about material. Receptive to material. Strategic use of product, etc.

(2) Students

Grade, number, experience, preparation, ability, disposition, etc.

(3) Faculty

Traits, expertise, teaching skill, experience, knowledge, professionalism, dedication, commitment, loyalty, leadership, strategy, productive, rigorous. Constantly reviewing and improving the curriculum. Career guidance/counseling, etc.

Understanding about education/students : Meaning is constructed, not prescribed. All individuals have equal intrinsic worth. All people have an innate desire to learn. Every person has the potential to change and to bring about change. Aversion to risk-taking stifles innovation and creativity. Valuable learning results from both failing and succeeding. All adults share responsibility for the well-being of all children. Ability to discern and create connections is the essence of knowing. Process of education is more than merely the accumulation of facts.

(4) Facilities

Classrooms, laboratory, computer/network facilities, presentation facilities, design studios, testing and evaluation facilities, etc.

6. Practice of "Mathematics Course for Designer Raising"

6.1 Outline of Development

The progress of developing our courses is as follows:

6.1.1 Conceptualizing "education as designer raising"

We have been confident that it is necessary to introduce the viewpoint of "designer raising" into the education. This is our rough inference (not necessarily deductive):

"Teacher = information designer" follows from "instruction design = information design". "Teacher = project/enterprise/business designer" follows from "teacher = planner of education". "Teacher = 'well-being' designer" follows from "teacher = instructor of 'well-being'". Thus, "teacher = designer". Finally, "teacher training = designer raising" follows from "teacher = designer".

This standpoint of education matches the social situation in Japan, where the trend of individualization/diversification is marked in many fields, and, accordingly, career courses chosen by graduates of the teacher training course have been diversifying, and therefore students must be educated to obtain the trait required to be "well-being" in changing society. -- It is required for the faculty in teacher training course to think of their "human resource development" in a broader sense. We propose the idea of "designer" as "person-of-ability required in the changing society".

6.1.2 Conforming the education in the teacher training course to the situation

We planned to practice it and to achieve satisfactory results, with restricting the classes to ours. It is required to apply different types of instruction because the classes are of different condition to each other. Our method is as follows :

In the case of a class where the attendants are many, and only "lecture" is allowed as the form of instruction, the instruction is made in the form of "homepage-based digital presentation".

"Demonstration of 'information design'" is one of the important effects we estimate. And we explicitly make "information design" a subject as well, in the form of "instruction-design/teaching-material-making = information design". A homepage-based self-learning system is served. This is necessary because instruction becomes speedy in the case digital presentation is its form.

In the case of a class where the attendants are not so many and, therefore, the homepage-based

training is possible, the class is designed to be of "report (as homepage) making".
Students' results are evaluated from the viewpoints: "Do they reach an subject(content)-understanding aimed at in this stage?" "Do they reach an information-design-ability aimed at in this stage?" In this case, the homepage-based self-learning system mentioned above works especially in the manner : (1) Report making is a work on computer. Operations required there are carefully instructed; (2) While making the report, students can refer to the system about the subject (meaning, application, etc.).

In the case of the seminar, where "self-development" is set to be student's general objective, students are to develop teaching material for WBT, to undertake interactive remote-education (make program and perform), etc., while developing the skills for planning, contents making, product-out, and so on, through practice.

5.1.3 Making a web-based infrastructural system for the "designer raising" course

"Designer raising" course mentioned above is impossible if it is not accompanied by a system, which brings a high efficiency in the class-management, whence staff become possible to reserve energy for undertaking the course. Thus, a system, which is web-based, was made for this purpose. And the self-learning system was combined to it. From the viewpoint of software, the system is : web server (Apache) + dynamic page script (PHP) + database (PostgreSQL)

5.1.4 Opening new classes for instructing basics

"Self-course development" : This is to lead/help students to design/develop their course by themselves. Ten lecturers are invited from business world. Each makes one lecture.
"Information design" : This is to make students to obtain basic knowledge about information design and design in general. Twelve colleagues of the authors participate. Their specialties are different. Each makes one lecture.

6.2 Web-based Management

"Designer raising" course mentioned above is impossible if it is not accompanied by a system (practically, an infrastructure), which brings a high efficiency in the class-management, whence staff become possible to reserve energy for undertaking the course.

Thus, a system, which is web-based, was made for this purpose. And the self-learning system was combined to it. (Cf. http://m.iwa.hokkyodai.ac.jp/icsu_about/) The url of the homepage for self-learning is : http://m.iwa.hokkyodai.ac.jp/school/

From the viewpoint of software, the system is: web server (Apache) + dynamic page script (PHP) + database (PostgreSQL). Primary instances (tables) of which the database consists are : instructor, student, class, class-instructor, class-student, chat, notice.

6.3 Courses

Type	Class Name	Semester	
		Spring	Fall
"Audit" (Digital Presentation)	Elementary School Mathematics	●	●
	Information Design	●	
	Self Course Development	●	
"Report Making" (Report Making = Homepage Making)	Lower Secondary School Mathematics	●	●
	Upper Secondary School Mathematics	●	
	Experimental Study in Mathematics Education		●
"Plan & Product"	Integrated Research Activity (2001)	●	●
	Seminar on Mathematics Education	●	●

"Elemenatary School Mathematics"

The instruction is made in the form of "homepage-based digital presentation". Contents are : Essence, way of understanding, of a subject; Instruction design, instruction method; Mathematical subjects of which the lower secondary school mathematics consists

The contents displayed on the screen are the webpages, which are "presentation" version of the "self-learning" pages, and stored in the server. Some pages include such materials as Shockwave movie, QTmovie, video streaming, sound, except for text, still image. -- By means of visualization, animation, mathematical subjects become easy to be understood, whence instruction itself becomes efficient.

Students can minutely and repeatedly study, in the "self-learning" homepage, more of the contents presented in a lecture room

"Information Design"

This is for making students to obtain basic knowledge about information design, and design in general. Students are to understand the important concept : "Information design is required because the one who is to receive the message is the 'other' (in the sense of philosophy)". Its range of application is very wide (practically, infinite).

This class becomes also an introduction to IT, media technology, design technology.

Twelve colleagues of the authors participate. Their specialties are different. Each makes one lecture.

"Self Course Development"

This is to lead/help students to design/develop their course by themselves.

Students have been indulged from the society and strengthening their inclination to be passive. If this continues, it is difficult that their experience in the university is to be successful. Thus, it is required to make them become conscious of "designing/developing one's own course by oneself" and start practicing this, while reforming their trait.

Ten lecturers are invited from different fields of business. Each makes one lecture.

"Lower Secondary School Mathematics"

In this course, students advance their learning by making reports in the form of homepage (five reports per semester). Each report is a scenario of instruction, following which a mathematical subject is taught. The learning is of practical and problem-solving type.

Each student is given a theme, which is a mathematical subject in the lower secondary school mathematics. They must, firstly, understand its essence/meaning. They do this by using the "self-learning" system. They can learn "homepage-making" too, in the same way.

Next, they are to make instruction scenario for teaching the subject.

The learning brings to students the followings :

a) Understanding the stance
   -- "To view the school mathematics from a higher standpoint of mathematics"

b) Progress of class-design ability

c) Progress of digital-contents-making skill (computer/network literacy, application-software-operation skill)

d) Discipline of general ability
   -- Acting subjectively and independently. Adapting to works of problem-solving type. Making habit of completing works by the deadline. Making habit of getting results, etc.

"Upper Secondary School Mathematics"

In this course, students are to make inquiry into the subjects in the upper school mathematics. The learning is of practical and problem-solving type.

In order that this type of activity is possible, "Mathematica" is used as a mathematics-inquiry tool.

Students must master the basics of Mathematica during the first one month. In order that their learning is efficient and completed in the period, students are recommended to have a book where "application of Mathematica to the study in linear algebra and calculus" is the theme.

After mastering the basics of Matehmatica, students enter the stage of : (1) making inquiry into subjects of linear algebra and calculus by using Mathematica, (2) making "self-learning" homepage where upper secondary school students learn linear algebra and calculus. (Mathematica is supreme even as an instruction-contents-making tool.)

What this course, as a general discipline, brings to students is the same as "Lower Secondary School Mathematics" and "Experimental Study in Mathematics Education" do, which is described before. Indeed, this course, as a general discipline, is meant to be an extension of the latter two.

"Experimental Study in Mathematics Education"

The style of leaning in this course is almost same as that of "Lower Secondary School Mathematics". The difference is : Students are to make mathematics self-learning homepages targeted to lower secondary school students, in stead of teaching scenario.

Students have already passed the first semester of "Lower Secondary School Mathematics" and there gotten the hang of studying mathematical subjects and representing their understanding to homepages,

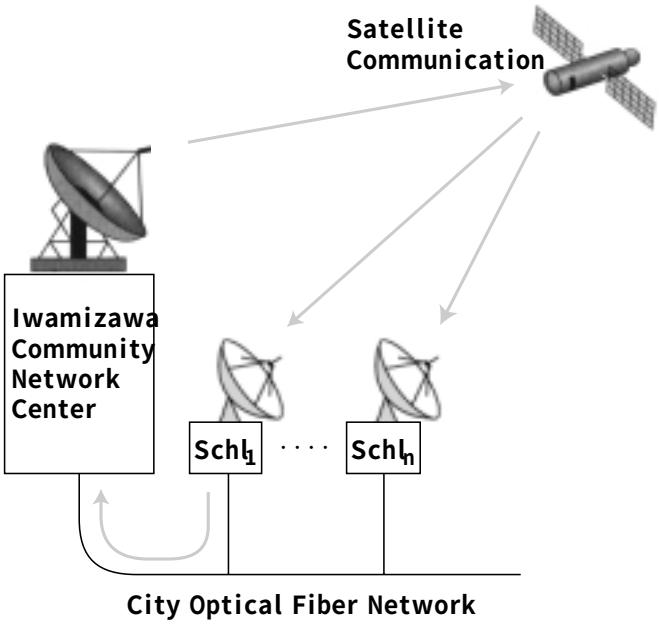
What this course, as a general discipline, brings to students is the same as "Lower Secondary School Mathematics" do, which is described before. Indeed, this course, as a general discipline, is meant to be an extension of the latter.

"Integrated Research Activity" (2001)

This course was designed to be a discipline of the ability for "planning project/business" and "designing/sending information", from the standpoint of "developing integrated ability".

In the first half (spring semester), the students planned and broadcast programs of "FM Hananasu Japan", a local FM station in the city of Iwamizawa. (The students were divided into two groups, and each group made a program.)

In the latter half (fall semester), the students planned and broadcast one of 22 programs of "CS Distance Learning" presided by the Iwamizawa city school board and the Iwamizawa city education research laboratory. The program was broadcasted at the Iwamizawa City Community Network Center via interactive distance education system.



In each job, the students were put in a position responsible for the results, which is a precious experience for them. Thus, the content of the course may be expressed "real social practice".

"Seminar on Mathematics Education"

In this seminar, it is ruled that students are responsible for developing their own ability. Here ability for planning and computer/media-literacy (web-design, etc.) are regarded basic.

The ability/skill to be developed is about :

a) Mathematics education : Objectives of mathematics education. For each mathematical subject, its meaning. Instruction/learning media. Instruction/learning method. Instruction design, etc.

b) Planning, practice, product-out : Making plan/proposal, etc.

c) Digital contents making : Homepage making, web design (HTML, Flash, etc.). CG. Digital

movie editing; etc.

d) Web-based instruction

e) Broadcast (TV/Radio)

And the task/assignment is :

a) Developing ability.

-- Especially, making the experience in university mathematics be a sound selling point.

b) Representing (PR) ability in the form of web-design.

c) Making and broadcast programs of TV/radio

-- Making and broadcast a program of "CS Distance Learning" presided by Iwamizawa city.

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