Technology for the Classroom in Japanese Education Context

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Abstract

Everybody can foresee that our expertise, everyday life, ethics and the way of thinking will be forced to be changed at the moment when all families and working places own personal computers and automatic language-translation tools available with them, and when operation of genes will become general.
New technologies such as high technologies, scientific technologies, information technologies and biotechnologies have powerful image on the change of policy, economics, thought, education, science and technology.
In this paper current trends and prospects of emerging technologies and education reform in Japan are discussed and the development, utilization and application of new information technologies in the classrooms are proposed coping with the trends of educational thoughts with special emphasis on the several features of multimedia.

1 The Emerging technologies

Technologies in these days can be divided into four categories as follows, though they do not independently exist with such fundamental technologies as digital, liquid crystal display, database and interface technologies;

(1) High Technologies

High Technologies means technologies in the frontier, while all the present technologies imply high technologies with their own nature. In this context when we call high technologies it includes such concept as time scale and quality of the technologies.

(2) Scientific Technologies

So far we have the word science and technology, especially by the end of 18th century Science and Technology had completely different concept as their own: science was searching for the truth and cognition, while technology focused on the production. But in the end of 20th century, science and technology have gradually been closing each other. In other words, science was no more the fundamental for the technology, but technology push the progress of science. Which could be seen in the development process of computers and human information processing.

(3) Information Technologies

When we talk about information in the high technologies era, we have to identify the word information as a limited one or concept: it is marked by the concept of objective

away from us human beings or with the use of computers and communication tools, which are called new information technologies (NIT), the modification and delivering are existing independent to human beings. It could be easier to understand that when we consider about the history of technologies: all the technologies in the past are existing on the extending line of a part of our external organs such as hands, eyes etc. not of the internal organs such as brain. The telescope is the tool for expanding our role of hands, vehicles are also shortening the time and distance etc., while the computers are expanding the role of our internal organ, our brain.

(4) Bio-technologies

Bio-technologies has really started in 1953 when Watson and Click found out the structure of DNA followed by succeeding the transformation of them to make biology step forward into technology. In addition to this the substance gene is a vehicle, which carry information, or patterns. At the beginning of the history of biology, it was not called technology but just skill to maintain the natural condition in terms of internal and external organs of our body.

2 Information Technologies

Now in Japan we have nine TV channels and several radio channels, while the number of CCTV channels is expected to increase in the very near future because of the rapid progress of digital technology. At the same time with the application of digital technology to TV system the TV channels will also easily increase in number to 30 or even to 100, which is one third of now available in US.

Information is transmitted not only by TV sets, but also radios, newspapers, weekly and monthly magazines. These are so called media, which carry messages with their own formats. The *Figure 1* shows the kinds of media, which are marked in nature by the speed and volume of information carried. In addition to this the information on each media will differ in terms of its quality and time span as sown in *Table 1.*

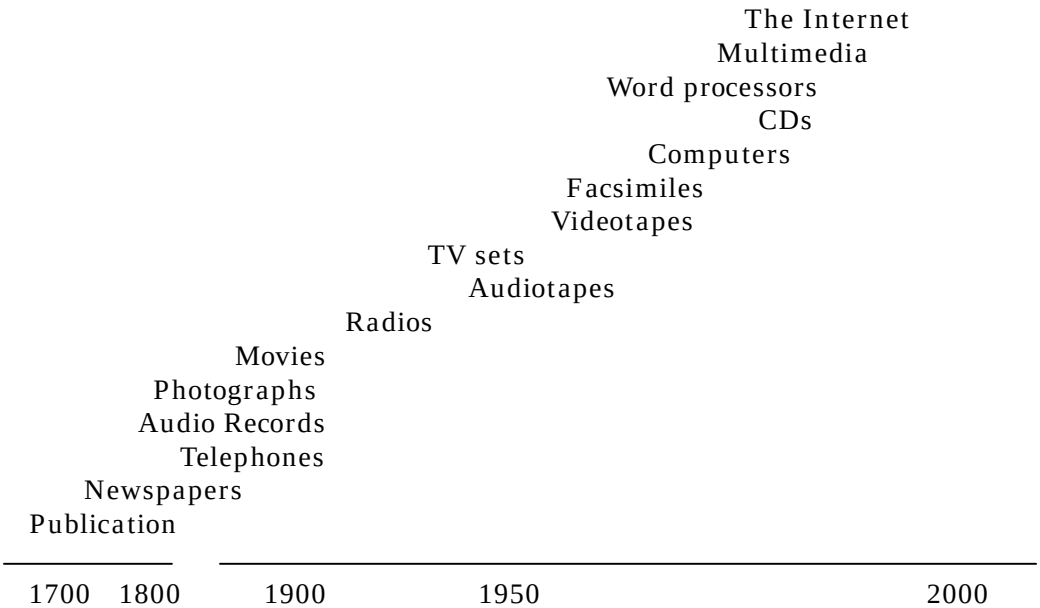

Figure 1 Advent of Existing Media

TV sets and newspapers are appropriate for delivering dairy and live information, while weekly and monthly magazines normally carry common and higher level of contents and both of them are specialized not only by explaining the comparison of several events but also by presenting the objective knowledge and understanding. The books will be main media in general.

In Japanese history we can find out in certain periods of time when citizens were away from knowledge and information to be just followed by commanders, but now indeed every citizen realizes that the right to know is a fundamental one in the democratic society

Table 1 Classification of Media in terms of Delivering Time Span

Second	telephones, radios, TV news, facsimiles, e-mails
Day	newspapers, radio and TV commentaries, mails
Week	weekly magazines, news films, TV commentaries
Month	monthly magazines
Year	books, records, movies, CDs, database
Century	libraries

3 New Information Technologies - Multimedia -

(1) Development of New Information Technologies

In recent years, micro processing unit (MPU) became in high-speed and smaller but with large capacity, while technologies such as liquid crystal display and CD-ROM are identified as emerging technologies. These computers related technologies have contributed to the standardization in compression and representation of various kinds of information, and then the database and interface technologies also became new streams in the Japanese society as well as in the world.

New information technologies integrate several current media such as 16mm films, video tape recorders, still-cameras, CD, LD and slides to give us new alternatives for exchanging information. Especially an advent of so-called multimedia, which is characterized by stronger interactivity, has served as a driving force for the school reform as well as for the better dairy life in economic, social and cultural development of the nation.

Recently, in addition to multimedia, newer telecommunication technologies represented by the Internet with high quality database give us global communication facilities.

It is expected that the new types of personal computers and the information and telecommunication system based on the new information technologies give us more flexible and open learning environment.

(2) Multimedia Personal Computers

Compared to the past personal computers (PC), multimedia personal computers (MMPC) are marked by such features as with CD-ROM of 640MB in capacity and with

high quality audiovisual capability. According to the “Standard of MMPC ver.2.0”, announced in May 1993, the basic features of MMPC are as follows; (i) resolution of the display: 640 x 480 - VGA, (ii) CPU: 486SX (25 MHz), 4MB or more capacity for memory, and 160MB or more capacity for hard-disk, (iii) CD-ROM drive: built-in double-speed, and (iv) 8-bits digital audio and MIDI capabilities.

Since then, because of competitive development MPU all of these features are changing into newer ones in terms of higher speed and bigger capacity. On the other hand based on the report titled “Promoting Audiovisual Education Utilizing New Education Media (Report)” by the Ministry of Education in March 1992, the term “hypermedia” is defined as a unified device with the use of computer that processes texts, sounds, and images and turns them into audiovisual materials.

The adoption of this definition can be appreciated in the materials created during the project "Development of New Media Materials", conduced by the Ministry in 1988. The importance of utilizing expensive instruments - computers, compact disks, and videodisks - to gather and process audiovisual information for educational purpose is still considerated. In another words multimedia, in general, contains a vast bulk of high quality information compiled in the node of the network with the links, which is characterized by “non-linearity.”

So that the users of multimedia have stronger interactivity with such system or information in the nodes to retrieve, browse and customize according to their own idea and interest. They interact with multimedia as they may think, which enables them to help learn by themselves and change their way of thinking or transform their cognitive structure by expanding their world of thinking activities. In addition to this since learning process by the users is compiled respectively in the system the multimedia is considered as one of the effective media that makes education more scientific and promote education with a various range of audiovisual media. In this connection, multimedia include design technology and control technology with modeling, which should be considered as key issues when we think about information education for all school levels as well as that for tertiary education situations.

Figures 2 and *3* show the utilization framework of multimedia computers and concept of classroom usage of multimedia computers respectively.

4 Educational Meaning of Multimedia

(1) Specification of Multimedia

The concept of hypermedia or even multimedia was introduced by V. Bush in his thesis of 1945. However, it was not until some years ago that computers make it possible to incorporate multimedia in education. Since then, several reports have been written on development and evaluation of educational material, installation and development of an interface that integrates different kinds of media, non-structured and non-linear information processing, and validation of the use of different styles of programs and lessons.

The educational meaning of multimedia can be specified as follows:

(1) Convenience in the way of accumulating and utilizing information,
(2) An instrument for emitting thoughts or divergent thinking skill,

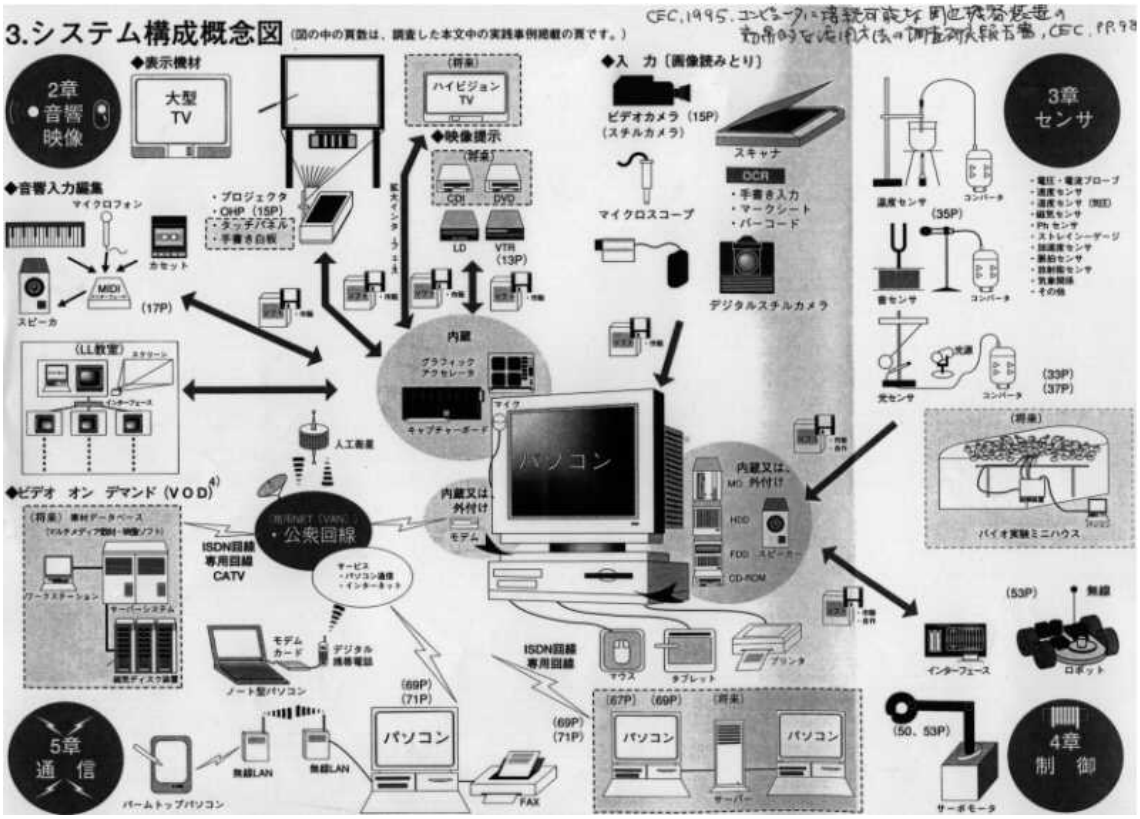

Figure 2 Utilization framework of multimedia computers

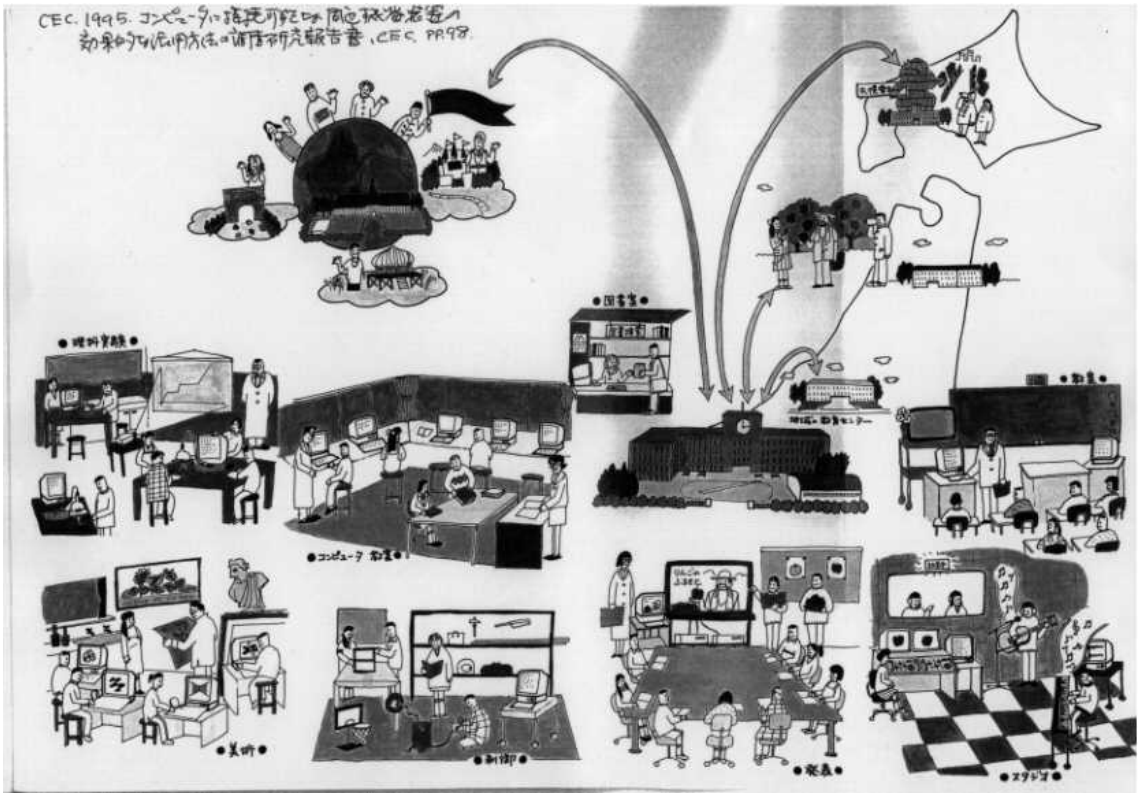

Figure 3 Concept of Classroom Usage of Multimedia Computers

(3) Applicability of individualized or personalized lessons,
(4) Clarifying the approach to the educational process.

Lessons using multimedia were expected not just as a "Trait-Treatment-Task-Interaction (TTTI)," but as a more complicated transformation that involves: learners, learning subject, learning material, and application of learning process or lessons. To develop, theoretically and empirically, these 4 factors of transformation the following research themes were proposed:

(1) Various themes of study on hypermedia
(2) Composition of hyperdocuments
(3) Navigation
(4) Application of methods
(5) Results of hypermedia studies
(6) Hypermedia literacy

This means that the no-structure characteristic of hypermedia allows a "Trait-Treatment-Task-Interaction (TTTI)" and a expanded and customized information according to the students likes and feelings. Students reorganize the information in a creative and personal way by editing it as something of their own. The tendency has been to prioritize multimedia ability to make improving changes and to accelerate the development and use of multimedia material in schools realized by the MMPC, which is, in this connection, identified with the unified form of “TV with telephone and high quality audio system.”

(2) Development of Multimedia

There are 2 theories of the development of multimedia. One prioritizes the origin and principal characteristic of a non-structured material and system, while the other refers to computer assisted instruction (CAI) with the addition of images and sounds.

In CAI, teachers define the goals to be achieved and the students help themselves with textual, audible, and visual information. Consequently, multimedia is delivered to let students establish their own goals and to search and choose from a vast variety of information depending on their needs and interest.

Basically, the introduction of multimedia in education started in Japan in 1988 with the financial support of the Ministry of Education, Science, Sports and Culture. The first multimedia materials were "Bunkyo Museum” (1989) and "Hyper Science Cube" (1990). These experiences were collected and further developed in subsequent materials: "Hyper Science Cube II” (1991), ”Inoshishi-Kegaji: Life of Shoeki Ando” (1992) , "Manual for the Utilization of Hypermedia", "Hyperscience: Weather Information" and "Japanese Language Education: Shopping in Hypertown" (1993).

These multimedia or hypermedia materials are expected to change educational theories, utilization of materials, and application of development methods. Consequently many other institutions and interests groups have been producing programs to accelerate the introduction of multimedia and hypermedia in education.

5 Current Trends of Education with Special Emphasis on Multimedia in Japan

In 1985, the National Council on Educational Reform was established under Prime

Minister. The establishment of such a council had not occurred in 30 years since the Japanese Education Reform Committee was dissolved in 1952. In a series of reports made by the Council, the need to reform education in order to be able to deal with the shift to an information-oriented society was pointed out. It was reflected in the revised Course of Study of 1989 in the form of 'Information Education.'

Consequently, the Ministry of Education, Science, Sports and Culture has been developing policies to deal with the shift toward an information-oriented society. These policies include the following focal points:

(1) fostering information literacy, including the ability to obtain desired information from the vast abundance of information available and to use this information efficiently,
(2) applying new information media in education, science, culture and sports,
(3) developing highly skilled technical personnel to lead the shift to an information-oriented society, and
(4) adaptation of educational facilities to the shift to an information-oriented society and development of information networks.

There is also growing interest in the use of multimedia in education. If it is used appropriately and effectively, it has great potential to be a valuable learning tool. However, a number of issues, from philosophical questions to the development of infrastructure, must be tackled.

The Ministry of Education is not the only government sector striving to accelerate the shift towards information-oriented society. The Ministry of Post and Telecommunications (MPS) and the Ministry of International Trade and Industry (MITI) are also making efforts to establish a fiber-optic communications network, which will link schools, libraries and other facilities throughout Japan.

In 1989 the Ministry of Education, Science, Sports and Culture announced the on-going school course of studies, which are characterized by the promotion of "New view of learning ability" that includes ability to present idea, ability to think and ability to judge by students' themselves. The concept underlying in that course of studies is also strengthened in the latest version of course of studies published in the end of 1998 and at the beginning of 1999, which will be partly effective in April 2000. The key concept is called as a spirit to live in the uncertain 21st century.

With regard to information literacy education, the 15th Central Council for Education recommends in July 1996 the following key issues, which are still existing at the highest priority in the education reform in Japan; (i) Systematic implementation of information education, (ii) quality improvement of school education with utilizing information and communication network, (iii) establishment of 'New School' coping with highly information- and communication-oriented society, and (iV) promotion of information morals and fostering human being considering the worse aspect of information-oriented society such as less attention of copyright and privacy issues, less contact of human beings and less direct experiences among the students.

In May 1997 'Action Plan for Revolution and Creation in Economical Structure' prepared by the Minister's Secretary is opened to public to recommend the utilization of multimedia and information network.

In August 1997 revised edition of 'Education Reform Programme' by the Ministry of Education, Science, Sports and Culture pointed out the systematic implementation of computers and software into school and the utilization of the Internet in schools throughout Japan.

In April 1998 the third edition of 'Education Reform Programme' pointed out the following issues: as for the primary and secondary education level, (i) further utilization of computers in primary, upper secondary and lower secondary schools, (ii) compulsory of basic contents of information education in home-economics in lower secondary schools, (iii) creation of new subject on information education in upper secondary schools, (iv) further securing of educational computers in schools, (v) development and securing of educational software, (vi) systematic securing of information and communication network in schools, (vii) securing of educational centers as main bases of regional network of schools, (viii) promotion of research in utilizing the Internet and its related fields, (ix) promotion of cooperation in several pilot projects carried out by private as well as public sectors, (x) development of pre-service teacher education curriculum for information education, (xi) promotion of leadership among teachers coping with the progress of information-oriented society, and (xii) securing of national education center for providing comprehensive information on education and culture, while as for the utilization of multimedia in higher education level (i) promotion of university network utilizing satellite, (ii) research and development of education contents and methods using multimedia and providing higher education institutions with its results, and (iii) further utilization of multimedia in higher education institutions.

In these connection as mentioned earlier especially for primary and secondary level of education new course of studies have been published with several kinds of information education subjects.

Regarding the change of idea underlying the new approach to teaching and learning *Table 2* could be referred as a general schema world-wide, under which both constructivism and situated learning could be easily imagined, though it is not published in Japan but in UK.

Table 2 Is this 'New Curriculum' - New Developments in Teaching and Learning -

Viewpoint	Until 1990's	'New' Learning
Approach	Emphasis on Content	Process-oriented
Focus	Teacher-centered	Learner-centered
Role of Teacher	Expert	Supporter, guide
Emphasis	What to know?	How?
Learning activities	Individual	Group
Mental posture	Competitive spirit	Collaboration
Role of Learner	Passive	Active
Task	Premediated	Adaptive
Topic	Forced	Deliberation
Error	Failure	Accepted, learn from errors

With regard to computers in education in Asia and the Pacific region, in 1995 Unesco PROAP published the book 'Computers in Education – An outline of country experiences –' in the form of compilation of the result of APEID Tokyo Seminar, which

was held in September 1985. In this book it is hardly difficult to find out such rapid progress of computer and its related technologies. All representatives from countries including those from Australia, China, India, Japan, the Philippines, Sri Lanka and Thailand show the computers usage as CAI tools, not as presentation tools. And at the same time it is dare to say that they could not foresee the dramatically change of education thoughts, behind of which the impact of multimedia on education is marked as constructivism and situated learning mentioned earlier.

In 1986 followed by the summary report, Unesco PROAP published another title of book 'Developing computer use in education – Guidelines, trends and issues' where also it is hardly difficult to find out the current trends of using computers in education. The heading Likely future developments includes five categories such as (i) Reduction of hardware costs – increased sophistication, (ii) Computers and communication, (iii) CAI, CBL and CBT, (iv) Video technology and (v) Teachers and computers, in which it is also difficult to think about now on-going educational uses of multimedia computers, though indeed nobody can imagine the rapid progress and development of multimedia and the Internet.

6 Conclusion

It would not be wrong to say that, except for a few cases, the introduction and utilization of computers and information networks in schools have just started in Japan. Even though the progress of several technologies especially those concerned new types of education system is so rapid, it would be better to reconsider that in order to carry out the education reform the 'requirement-pull' will have much more higher possibilities in success than 'technology-push' as Glennan, T. K. summarized with the survey of innovation study in 1973.
In Japan the number of children has been decreasing, to a degree that we have not experiences before. Many classes not only in rural areas but also in urban areas have been combined because of the decrease in the number of students and the depopulation in those areas, and maintaining education in those areas is becoming more difficult. If multimedia is used appropriately, it has a great potential to be an effective tool, not only to enrich existing programmes but also to deliver education to those areas. However, besides developing infrastructure, tasks to train both prospective and in-service teachers, and many other problems still exist to realize an efficient use of new information media in classrooms.

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