Summary of K12 activities in Japan

Kunio Goto [1] Masaya Nakayama [2]

Abstract

This paper summarizes K12 related activities in Japan. Also we discuss the problems to make use of the technology in classrooms and possible solutions to those problems. The information collected for this paper is summarized and can be retrieved from "URL: http://k12.jain.ad.jp/".

1 Introduction

Many schools from kindergarten to high school have been connected to the Internet in the United States as a result of so-called K12 project. What is going on in Japan?

Interest to educational use of the Internet in Japan has also been growing rapidly in these years. We can see the current number of schools and universities already connected or going to connect to the Internet from the number of allocated JP domains[1] as in Table 1.

Table 1: Allocated domains for schools in Japan

Complete up-to-date list is available from JPNIC ftp server[1]. (as of April 24, 1995)

School type	# of domains	%
elementary schools	12	
junior high	19	
senior high	45	
college of technology	52	90 %
American school	1	
subtotal	130	
polytechnic college	10	
junior college	58	10 %
university	297	56 %
All JP domains	2789	

Table 1 shows 56% of universities have its domain name. Also the number of connected junior colleges (two-year) is growing rapidly. Small but not negligible number of schools below university/college is going to connect. One exception is college of technology, called "Koutou Senmon Gakkou". College of technology in Japan may be a unique school system. It provides 5-year course focused on technologies while ordinal senior high school does 3-year course. Most of colleges of technology are already connected to the Internet as a result of themselves and others' effort.

Universities are connected to the Internet via research/educational internets in Japan. Some experimental classes such as international collaborate writing or cross-cultural communication are given at some of the universities [2, 3]. Also interests to educational use of the Internet in high schools, junior high schools, and elementary schools are rapidly growing.

At university/college level, there are few problems with using the Internet for education since IP environment is already available in many cases and professors have more flexibility in the curriculum and have more human resources than at K12 schools. At K12 schools, there are many problem with using the Internet for educational use. Unfortunately, there has been no support for Internet access by national government for senior high school nor lower education while universities may use SINET, sponsored and maintained by higher education division of Ministry of Education (ME), for a domestic/overseas IP connectivity. Therefore, most of the K12 activities have been rather independently seen in efforts by interested individuals on a number of BBS, interested groups of teacher/professors, or some non-profit foundations. Recently, Ministry of International Trade and Industry (MITI) has just begun "100-school networking project" in cooperation with ME. Most of the 100-schools should be IP reachable by the end of June 1995. This is a big project and may accelerate the use of the Internet in schools. Therefore it is a good time to summarize the previous effort by many people and point out the problems.

In the next section, we introduce individual efforts and summarize their activities and contact addresses or URLs. Section 3 is devoted to the status report of the "100-school networking project". Note the description of the "100-school networking project" in this paper is by no means official. In Section 4, we discuss the possible prob-

1 <goto@iq.nanzan-u.ac.jp>, Dept. of Information Systems and Quantitative Sciences, Nanzan University. (http://www.nanzan-u.ac.jp/goto-lab/goto.html) Dr. Goto's work is in part supported by the research grant from the Center for Educational Computing.

2 <nakayama@nc.u-tokyo.ac.jp>, Computer Centre, Univ. of Tokyo. (http://www.u-tokyo.ac.jp/centre/nakayama-e.html)

lems to be solved for using the Internet effectively in schools. We will try to give answers to part of those problems in Section 5.

The authors are volunteers of two different regional networks, Tokyo Regional Academic Inter-Network (TRAIN) and Tokai Communication Platform (TCP), respectively. Those regional internets provide IP connectivity to part of the 100 schools, and are interested in not only connecting the 100 schools but also promoting other schools to connect and most importantly help/arrange a discussion in SIGs (special interested groups) at domestic research/educational organization or at regional networks how to effectively use the Internet in education.

2 Independent Activities

In this section, independent activities by groups of people or organizations are summarized.

2.1 Experimental class projects

The following is an incomplete list of experimental class projects using the Internet. There are many other activities not listed because the information could not be found by the authors. Although URLs are listed, they are slow in providing information in English because it is very time consuming task to write documents in two languages. Please use a WWW browser with Japanese language support or be patient.

1. PEWI (Project on Education With Internet) [7] (attached elementary school of Yamanashi University)(4/26/94 –)
   http://133.23.90.99/narita/pewi.html

2. Global Classroom Project [7] (communication using IP mulicast tools between junior high schools in Kyushu 7/12– 7/15/94)
   http://www.is.saga-u.ac.jp/ai/global-classroom.html

3. my-ami project [7] (9/94 –) Minamiyawata and Amino high school in Kyoto prefecture.

4. Hawaii–Nanzan Joint Class (university level international communication) (9 – 12/94)
   http://www.nanzan-u.ac.jp/goto-classes/UHNZU/index.html
   See also [2, 3, 7]

5. Apple Media Kids (Joint project by Apple and Center for Global Communications, International University of Japan) (10/94–)
   http://kids.glocom.ac.jp/MediaKids/

6. 1000 Cranes Project (international communication between elementary schools supported by Yasuda Women's University)
   http://www.yasuda-u.ac.jp/unv-info/jplus/043/043327/index-sjis.html

PEWI is a long term continuing project supported by many teachers and faculties of Yamanashi University, which is a member of TRAIN.

Global Classroom Project was a short term unique project. In the project, MBONE tools such as "vat" and "nv" are used over ISDN dialup IP link. It was broadcast on TV show on local TV station.

"my-ami" is a communication project using e-mail and other internet tools between two high schools in Kyoto prefecture.

Hawaii–Nanzan Joint class was class level experiment planed and implemented by one of the author and the partner in Hawaii. The details are presented by Kumiko Aoki in a separate paper in this conference[2].

Apple Media Kids is a joint project by Apple and Center for Global Communications, International University of Japan.

1000 Cranes Project is an ongoing project and provide not only information in Japanese but also in English on its WWW server.

2.2 Activities by organizations or volunteer groups

The following is the list of activities by various kind of organizations or volunteer groups. Tokai Schoolnet Society was established on December 12, 1994 to plan and implement, 1) Internet connectivity of schools in Tokai region, 2) effective use of the Internet in education. The first author is a staff from this regional network, TCP, subsidized by Tokai Internetwork Council (http://www.tokai-ic.or.jp/). Currently we have about 30 teachers from all over Japan and 3 educators from foreign countries in the mailing list. The teachers had dialup IP access with free of charge until the end of March 1995 to try WWW and e-mail etc. The council supports the activity but does not lead or define anything. The Society is owned and managed by the members themselves.

Also the authors are member of JAIN Consortium (JC). The JC has two 3-day meetings and one symposium in a year. As the activity of User Service WG, special sessions have been arranged for educational use of the Internet. The experimental projects mentioned above were reported in the past meetings or symposium.

1. AGENE (Association of Global Electronic Networking of Educators) (7/91–) – publishing a magazine called MagAGENE, annual meeting.

2. APIC (Association for Promotion of International Cooperation) http://www.apic.or.jp/ – "What's Japan? & What's America?" project (9/93 – 3/94) with e-mail and video letters, operates a BBS called APICNET and supports Kids9x, Kidlink, Hotstuff, NGO, and AGENE

3. CEC (Center for Educational Computing) – supports 100-school networking project and other educational activities. Foundation supervised by ME and MITI.

4. IPA (Information-technology Promotion Agency, Japan) – supports 100-school networking project. Special foundation.

5. ACE (The Association of Computer and Education) http://www.iijnet.or.jp/apple/program/ACE.html

6. IAJ (Internet Association of Japan) – held Internet seminars for educators twice so far. supports 633 mailing list.

7. WIDE EDU-WG (A working group in WIDE project) – research oriented activities.

8. Teachernet (7/93–) – group of teachers and interested people
http://www.st.rim.or.jp/˜hasumi/tea.html

9. JC usv-wg (user service WG) – working group of academic internet open to the public.
mailing list: usv-wg@jain.ad.jp
http://k12.jain.ad.jp/

10. Mailing list maintained by the regional internet in Kyushu (open to the public)
regional-schoolnet@nic.karrn.ad.jp

11. Tokai Schoolnet Society (in Tokai Area) – 12/12/94– — regional group but participation of the mailing list is open to the world.
Contact: schoolnet-wg@tokai-ic.or.jp
http://www.tokai-ic.or.jp/Schoolnet/

12. K-12 SIG at North (Network Organization for Research and Technology in Hokkaido) – started their activity in a mailing list.

13. Forums in major commercial BBS/mailing lists
NiftyServe forum: FINET(Internet), FCAI, FKYOIKU-15 (Foregin language education), FJUNIOR (forum for kids themselves)
PC-VAN: STS (student, teacher, and software)
HWG(Hyper media Works Group): mailing list at chubu.ac.jp.

2.3 Collection of information

The following are the list of URL collection and original information resource collected by researchers/educators. The information on these servers are intended to be read by educators in Japan and therefore written mainly in Japanese language.

1. Kazuto Nishi (Aoyama Gakuin Univ.)
http://senna.agnoc.aoyama.ac.jp/

2. Masahiro Narita (Yamanashi University)
http://jizo.cer.yamanashi.ac.jp/narita/edudir/edudirhome.html

3. Toshiyuki Kamada (Aichi University of Education)
http://www.auetech.aichi-edu.ac.jp/˜tkamada/int_edu.html

4. Nobuo Hasumi
http://www.st.rim.or.jp/˜hasumi/index.html

5. Kunio Kirikoshi (Osaka Kyoiku Univ)
http://okumedia.cc.osaka-kyoiku.ac.jp/educ/

3 100-school networking project

"100-school networking project" is a joint project of IPA and CEC (Center for Educational Computing). CEC is a foundation for educational activities jointly supervised by MITI and ME.

In this project, schools (elementary to high school) will get Internet connectivity until March 1997 with no charge. IPA is building a center to help the operation of IP equipments at each school and to provide information useful for this project and other schools. Also regional networks are helping this project at voluntary basis. In this section, we summarize the schedule and the standard equipments provided to each of the 100-schools.

3.1 Schedule

The announcement of the project was made in August 1994. Public schools received the announcement through local office of education. Although the announcement was intended to be dis-

Table 2: Number of 100 schools by type

Type	number
elementary schools	18
elementary+junior high	1
junior high	29
junior+senior high	9
senior high	41
American schools	2
schools for handicapped	6
total	106

Table 3: 100-school Networking Project Schedule

```
Apr95  May     Sep  Oct -- End Mar 97

<-Install
  lation->
       <-- Test ->
               <-- Operation ------->
```

tributed to all the public schools, some local offices might limit the distribution. Private and national schools received the announcement directly or retrieved the announcement themselves from the article posted in some major BBS. 1543 schools applied for the project with their plans and proposals for effective use of the Internet in their education.

Since the number of the applications was far more than expected, reviewing process was delayed by about two months and finally about 100 schools were selected and the names were announced to the public in the middle of December 1994. The number by type of the schools are listed in Table 2.

The current schedule of this project is summarized in Table 3[5]. The installation is about two months behind the originally planned schedule but no further delay may not be allowed. Schools are becoming IP reachable day by day at the time when this paper is written in April. Many schools have plans to use the Internet in the second semester beginning in September in Japan.

3.2 Internet connection and equipments

Because of the limited budget, 35 schools are connected with 64Kbps leased line and the rest will use 3.4kHz analog(voice grade) leased line and high speed V.34 modems in synchronous mode with dedicated IP routers at both ends. At the best condition, 3.4KHz line can carry IP traffic at 28.8Kbps and compression will increase the throughput for uncompressed data transfer. This configuration is expected to be effective for easy maintenance including automatic recovery from electric power outage or disturbance on the communication line.

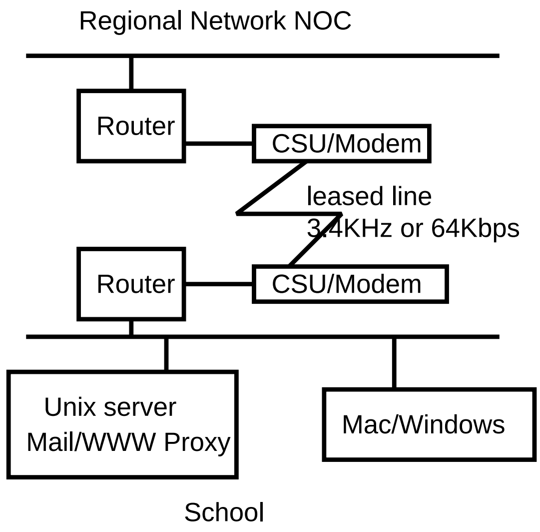

Figure 1: Standard configuration of 100–school connection

At each school, a Unix server and a Macintosh or Windows PC client are installed on a 10BaseT HUB segment connected to a regional network NOC via IP router. On a server, sendmail, WWW server, proxy and character code conversion server, and network news will be properly set up by a system integrator with the contract made by IPA. Note there are three common character code sets for Japanese language and a proxy server should convert the character code if a client can handle only one code set. Client PC or Macintosh will be set up to utilize those functions. Then at least each school has two terminals on which WWW client, E-mail, network news reader, and other standard application can be used.

Schools which already have LAN for classrooms or office may connect it to the 10BaseT HUB. However, LAN connection is not covered by the project because the diversity of LAN configuration at school makes it difficult. Therefore schools should add IP suite onto the computers connected to the LAN and set up software on them if they use classroom computers to access the Internet.

How do the teachers make use of the Internet in teaching, when the schools are successfully connected by the end of September? Though they have their own plans written in their application to the project, they may not know what can be exactly done with the Internet yet.

4 Problems in K12 schools in Japan

To have many schools connected to the Internet and make the teachers use it effectively, there are many problems we should solve. In this section, we point out the problems and suggest possible solutions in the next section.

The following is the list of the problems.

1. Technical and funding issues
   - Internet connectivity – funding and technical support,
   - LAN environment – technical support for IP applications.
2. Educational issues
   - Curriculum – integration to existing classes or special classes,
   - Teaching load.
3. Communication issues
   - Language barrier – problem in international communication,
   - Arrangement of matching classes for international communication.

4.1 Technical and funding issues

First technical and funding issues arise. Cost of the internet connection in Japan is relatively high. The total monthly cost for IP connection with 64Kbps leased line is at least 2,500 USD, if a commercial internet service provider is used. Although many schools already have PC lab but most of the PCs there are standalone.

In case of public school, regional office of education may set up a guideline for standard telecommunication equipments for a school. For example, if the standard is two telephone lines for voice and G3 facsimile, a school is not allowed to have another line for data communication unless they get some extra money from other sources. In case of private, national, or attached school of a university, teachers have more freedom.

Lack of technical knowledge/experience of IP suite and applications makes difficult for teachers to plan their facility at schools. Venders and system integrators may plan, install, and setup school LANs and equipments, but experienced engineers may not be available except in large cities such as Tokyo and Osaka. Once the equipments are ready, the teachers have to learn how to use the new toys, in order to teach the students. We need someone to teach teachers.

Though more and more introductly internet books are soled in bookstores, latest information is always on the net and it is written in English. Even English teacher may not understand technical terms.

4.2 Educational issues

Educational issues are more important. However, the authors viewpoint is rather technical and the following observation and discussion on educational issues may not be agreed by researchers in the field of education or educators, although the observation is based on the first author's own teaching experience at the university and teachers opinion in Tokai Schoolnet Society. Common problem is that there are rather rigid standard curricula defined by the Japanese government especially for elementary and junior high schools. Use of the Internet in the classroom should be integrated in the existing classes, or special classes may be opened if internet is extensively used.

4.3 Communication issues

If communication using internet goes beyond the national boundary, reading and providing information in English are very important for both of students and teachers. In general, many of schools in Japan have sister schools and are very much interested in international cross-cultural communication.

However, typical Japanese student even in university is very shy or incapable of expressing one's idea in English, which one has learned for at least six years in junior and senior high school. International communication using e-mail is a good motivation for the students to use foreign language for real communication. But study load for the students is imbalance between the partners and sometimes not fair if the language is the first one for a side and the second one for the other side. The language barrier problem may apply even to teachers. International communication is not easy to implement. Finding a matching class in foreign country, building a plan, finding a topic to discuss, and helping the students to communicate are all on the shoulders of the teachers.

5 Possible solutions

Some of the problems may be solved according to the guideline documented in FYI26 (RFC1709)[6] and the others cannot because there always be domestic/regional issues. In this

Table 4: tnn.edu+net news groups

News group	Purpose
tnn.edu+net.announce	announcement
tnn.edu+net.edu	teaching method etc.
tnn.edu+net.net	network
tnn.edu+net.misc	misc
edu+net-< *name* > @iijnet.or.jp	corresponding e-mail list

section, we will suggest some keys to solve the problem. For educational issues, the authors are afraid of presenting ideas biased to technical side of the internet, and, therefore, the plans submitted by the participants of Tokai Schoolne Society are listed as examples.

5.1 Nationwide communication channel and helpdesk

Success of the current experimental projects are one key to solve the first and the second problems. Financial support and network infrastructure will come if those projects show notable success. The experiences of the experimental projects should be made publicly available on-line to share the valuable information.

Due to the lack of nationwide communication channel for the educational use of telecommunication networks, many groups are independently exchanging information and the corporation among those groups is not very effective so far. To overcome the technical and funding problems, there must be a common communication channel for discussing problems, exchanging related information, and getting help.

The second author made an arrangement to have a communication channel for information exchange and discussions among all interested people in Japan.

EDU-WG of WIDE project has announced, in April 11, a new netnews subhierarchy named tnn.edu+net. An article posted to either a news group or the corresponding e-mail list will be delivered to both of them. So far the announcement has being forwarded to 16 mailing lists, 9 BBS, and 4 network news groups. We hope these news groups/e-mail lists shown in Table 4 work well.

Those who have news feed for tnn will receive/post articles via usual news system. To subscribe those news groups via e-mail, send an e-mail message to Majordomo@iijnet.or.jp with message body "subscribe $< email - list - name >$" as in the example below.

```
mail Majordomo@iijnet.or.jp
subscribe edu+net-announce
subscribe edu+net-edu
subscribe edu+net-net
subscribe edu+net-misc
```

There must be a helpdesk where they can find the solution to the technical problem. Since most of the document on Internet standards, drafts, and informational documents are available only in English, important FYI and RFC need to be translated into Japanese. To avoid excessive teaching load of the teachers, teaching assistants should be used. The assistants can be experienced university graduate students hired in part time.

Some volunteers including the authors will trans-
late some FYIs prepared for for educators into Japanese and those translated documents will be available from "URL: http://k12.jain.ad.jp/" (JC USV-WG WWW server).

5.2 Language barrier

To avoid the language barrier problem, some assistance from an organization is effective as seen in "What's America, What's Japan?" sponsored by APIC. In the long term, teachers should be given opportunity to learn not only internet technology but also refresh their foreign language skills at local universities. It is a good idea to have university students, who will become teachers, learn basic concept, and study how to effectively use the Internet in education.

We would suggest an international communication class choose a partner class from two categories so that the load for the students at both side is fair. One is Japanese language classes in foreign countries where the first language is English. There are many such schools in the US, Europe, and maybe in Asia Pacific. Japanese students mainly use English and the other use Japanese language and they help each other. The other is the classes in which the students learn English as a second language. It can be first simulated within a class and then proceeded to a real international communication where English is the only language to communicate. As a matter of course, providing photo and drawings on a web server helps building their friendship as well as written words.

We need some coordinators who provide consultation to help schools to find a partner for the international communication classes in addition to the common communication channel for posting "wanted" announcement. Such mailing lists and newsgroups are already available. Coordinators can be a group of volunteers from all over the world.

5.3 Examples

The following is the examples proposed by the teachers in Tokai Schoolnet Association. Some of them are already implemented using dialup IP connection or e-mail on BBS personaly subscribed by the interested teachers.

In case of few terminals for students

Connecting PCs in the classroom is desired so that each student can use WWW and a personal e-mail address. Without a personal e-mail address, the communication cannot be personal and may loose friendliness. Unfortunately if there are not enough number of client PCs to be used by the students, a teacher can retrieve information and print and distribute it in printed form and send e-mail on behalf of the students. If at least one client PC and a large monitor or video projector are available, which cost far less than distributing color photocopies, a teacher can show the screen of WWW browser to all the students.

- Print or view data on a large monitor as course materials: science class (image data on earthquake, astro, weather, environment provided by research institutes), social science (various statistics), international affairs (hard to find information in textbooks such as racial discrimination, AIDS), general information (OPAC of domestic, foreign public or university libraries)
- E-mail distribution of survey written by the students.

In case of many terminals in the classroom

If there are many terminals in the classroom, the students can read/write e-mail messages more often. However without strong motivation, they would not check their mailbox except for the class hours. Therefore the topic should be interesting and easy for them.

- Netsurfing to find information on specific topic and writing a research paper
- E-mail discussion with foreign students (earth environment, cancellation of Smithsonian Exhibition, gun control)
- On-line home room (daily report of the classmates' activity before the school is over)
- Creative project with other schools through putting information on servers (XX high school today–publishing journals, introding of the school, clubs, easy cooking, what's new in this week, school events, window of students association)
- Japanese language class (Discussion with graduate students majoring Japanology on specific issues in Japanese literature)
- Helth and living science (Global survey on legal protection of women)
- Social science class (Searching statistics on international trade. e.g. amount of exported wine from France)
- English class (Cross-cultural communication with a partner class via e-mail on specific topic)
- Keypals

6 Conclusion

In this paper, we briefly introduced the current status of K-12 activities in Japan. With the growing number of schools connected for the 100-school networking project, things will be quite different when this paper is presented at the INET95 meeting.

The authors keep trying the information available in English online from "URL://k12.jain.ad.jp/".

References

[1] Japan Network Information Center(JPNIC), "Domains in JP," URL: ftp://ftp.nic.ad.jp/pub/jpnic/domain-list-e.txt, April 24, 1995.

[2] K. Aoki and K. Goto, "International Joint Teleclass using the Internet and a Video Conferencing System: Implementation and Evaluation," Proc. of 17th Pacific Telecommunication Conference, pp.680-686, January 1995.

[3] K. Aoki and K. Goto, "Educational Application of the Internet: International Joint Teleclass," Proc. of INET '95, June 1995.

[4] Y. Sawada, "100-School Networking Project, " Document at APNG(Asia Pacific Networking Group) Meeting, 1994. (Available at URL: http://www.tokai-ic.or.jp/Schoolnet/100-project.txt)

[5] IPA and CEC, "(Various documents distributed to the schools and NOCs)," April 1995.

[6] J. Gargano, D. Wasley, "K-12 Internetworking Guidelines," FYI26 (Also RFC1713), November 1994.

[7] Proc. of JAIN Consortium Meeting (in Japanese), December 1994.

Author Information

Kunio Goto is Associate Professor of Dept. of Information Systems and Quantitative Sciences, Nanzan University. He teaches telecommunication and interested in computer networks and their performance evaluation. He is a member of IEEE Communication Society, ACM, IECEJ, and Operations Research Society Japan. His activities include Tokai Internetwork Council as a board member and a JPNIC steering committee member.

Dept. of Information Systems and Quantitative Sciences, Nanzan University, Yamazato-cho 18, Showa-ku, Nagoya 446, Japan Phone: +81-52-832-3111 ext. 748 FAX: +81-52-833-4920 <goto@nanzan-u.ac.jp> (http://www.nanzan-u.ac.jp/goto-lab/goto.html)

Masaya Nakayama is Associate Professor of Computer Centre, The University of Tokyo. He is a member of ISOC, ACM and IPSJ. He is interested in information retrieval system architecture at widely distributed environment. He was JP-NIC steering committee/general secretariat and he helps APNIC (Asia Pacific Network Information Center) activities as a staff. He is a board member of WIDE project for EDU-WG, and the User Service WG chair at JAIN Consortium. He is also a technical contacts of regional/campus networks (TRAIN, UTnet).

Computer Centre, Univ. of Tokyo, Yayoi 2-11-16, Bunkyo-ku, Tokyo 113, Japan Phone: +81-3-3812-2111 ext. 2720 FAX: +81-3-5684-7775 <nakayama@nc.u-tokyo.ac.jp> (http://www.u-tokyo.ac.jp/centre/nakayama-e.html)