

**OECD/CERI ICT PROGRAMME
ICT and the Quality of Learning**

**A Case Study of ICT and School Improvement at
the Junior High School, attached to School of Education, Gifu University,
Gifu, Japan**

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**Extension of Digital Learning Space
-From School to Home-**

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1. Overviews

The innovations held in the Junior High School attached to School of Education, Gifu University were as follows;

1. By using WWW homepage, the school supplied the information of daily learning activities and events to parents immediately. By using e-mail, parents could exchange ideas on it with teachers or consult on their specific problems without temporal limitations. Such ICT use promoted the communication between parents and teachers drastically, and parents could understand the school innovation much better. In addition, the information facilitated the communication between students and parents. In Japan, as a well-known phenomenon in such developmental stage, the communication at home tends to decrease. The information by the school functioned as a chance to start a communication and to reconstruct the parent-child relationship.
2. The school introduced the periods of integrative study, in which improved the abilities of students to utilize information. In the periods, students learned how to collect information, to analyze and sum up it, and to present their works using presentation tools and students homepage. Not only in the period but also in various subject learning, ICT was utilized as an educational tool and/or as a communication medium between teachers and students or that among students. This innovation was held in the collaboration with the elementary school attached to the same university.
3. ICT was also utilized for the improvements of teachers office works. By sharing information in the school using WWW and mailing lists, the number of meeting decreased while the quality was maintained or enhanced. As a result, teachers could be more engaged in creative and innovative works.

This school predicted all of the households of students would access to the Internet and the school homepage

in near future. They digitized various daily reports and documents, and put some on the homepage. They also prepared a groupware on the intranet to facilitate the sharing of the process and results of learning and the collaborative learning among students. Some of them could be browsed from each home.

2. Past:

The Junior High School attached to School of Education, Gifu University was established in 1951 by Japanese Ministry of Education. School of Education at Gifu University has also the attached elementary school. While this school is national and is financed by Japanese government, tuition is needed. Students were selected from the surroundings of Gifu City by the entrance examination.

The introduction of ICT was started in earnest by the appointment of the current vice-principal (As the principal is a professor of School of Education, the vice-principal is the substantial responsible person for this school). He tried to get financial supports and to encourage teachers to challenge innovation. They got the grants from the ministry and other public sectors and installed computers and LAN. Their LAN was connected with that of Gifu University via high-speed private line. In FY1997-1999, they got a government grant on the periods for integrative study .

The teachers who understood his ideal gathered and the innovations have spread to all of the school. At the point of time of this survey, all of teachers participated in the innovations, but the core members were about six teachers, such as those of the committee of information education.

1. Present:



Fig. 1 A computer classroom



Fig.2 Library

The Junior High School attached to School of Education, Gifu University consisted of 38 teachers, 15 classrooms (including 3 classrooms for handicapped students) and 487 students (FY2000).

They had two computer classrooms (42 computers and 22 computers each), and a classroom for group work (18 computers). Each home classroom, classrooms for special subjects except Music, and the library had also computers. In teaching subjects, teachers used computers in each subject classroom. Those in home classrooms were used by students. Each teacher has his/her own computer at their office. The total number of their computers was about 130.

On the network environments, they changed the speed of LAN from 1.5Mbps to 6Mbps in April, 2001. They planed to set up data outlets in all of their classrooms and to give an e-mail address to each student in FY2001.

They prepared environments both teachers and students were inclined to use ICT. To share information by digital report of daily classroom and to introduce electronic meeting and paperless meeting for teachers were such examples.

ICT was utilized not only in the periods of integrated study but also in traditional subjects, such as social studies. While computer classrooms were used in various subjects, Home and Technology in 8th grade and Period for Integrated Study in 7th grade had priorities to use.

Students used computers for WWW browsing, presentation, development of homepage, word processing and so on. Teachers developed electronic learning materials and did not purchase courseware. They planned to put printed materials and examination questions of the past on the homepage in order to increase opportunities of learning at home. They expected information literacy should be acquired not in systematic teaching in the class but in using it as a tool. Programming language was Logo in Home and Technology in 8th grade and Visual BASIC in an optional subject.

From April 2001, new curriculum oriented to integrated learning was adopted partially, and special hour for autonomous learning was introduced. The styles of education/learning were changing from Education teachers give to Education students request. In the process, the role of teachers is changing to assistance and supports to students, and methods and objectives of evaluation were renewed.

Teachers acquired knowledge and skills for ICT use on the job training. The school did not have special

seminars for ICT use. If they had questions, they asked them to their colleagues. Teachers of information education working group participated in the seminar held at the outside of school if necessary. In such teacher training, all of teachers acquired ICT literacy and began to use it spontaneously (Vice Principal). Needless to say, it means that they could choose the most adequate method in each situation. For example, they should select e-mail, telephone, or face-to-face meeting, as the most adequate communication medium. One of the current concerns in the Junior High School attached to School of Education, Gifu University, was how they should integrate learning in the school and that at home systematically by ICT. The learning by a student is not completed only inside the school, but it should be constructed in the student's everyday life from more holistic viewpoint. If all households of students have access to the Internet in near future, the school and teachers will supply various information to parents, and shape closer links between the school and parents, while students will easily access to the digital learning resources at school from his/her home. They had already started several ambitious challenges (see item 1 of Overview). Most of students can access to learning resources from their home computers from FY2001. In addition, attendance record and daily report of classroom activities were digitized, and a WWW camera was also installed tentatively. To guarantee the daily sending of information from the school, they reformed the school system. For example, they had a teacher in charge of PR who was reduced other obligations. There were few schools in Japan which introduced such new role for ICT use officially. As the use of ICT by parents was regarded as an important factor, the school held special seminars for the parents on Information literacy once a month.

One of the efficacies of ICT introduction was to increase free time both in teachers and in students. As teachers had such temporal surplus, they could have feeling of freedom, became more engaged in creative and innovative works, and facilitated the sharing of intelligence and knowledge. Students also became thoughtful and expressive.

In addition, they are preparing for a new project on international exchange program. They planned to have international collaborative learning with Korean schools by using ICT and by exchanging students in school excursions. They are also studying whether they can give opportunities of learning to students who have fears to go to school and those who have illness by using ICT.

4. Main hypotheses:

Hypothesis 1:

Technology is a strong catalyst for educational innovation and improvement, especially when the World Wide Web is involved. The rival hypothesis is that where true school-wide improvement is found, technology served only as an additional resource and not as a catalyst, that the forces that drove the improvements also drove the application of technology to specific educational problems.

Both the acquisition of information literacy, including the abilities to utilize computer, and the autonomic learning, realized typically in the periods for integrative study, were objectives of their school reform.

Evidence in support of the main hypothesis

Although computer was one of educational tools, learning behaviors expected in the periods for integrative study, that is, to investigate, to integrate and to present autonomously, were acquired efficiently in the environments in which students could use computers. On the other hand, the acquisition of information literacy was facilitated in their attempting to execute autonomous learning more efficiently. While ICT could be used in traditional subjects, it was more effective in the new learning paradigm. That is, ICT and the new learning paradigm developed and transferred in interacting as each catalyst of the other. After the introduction of ICT, new learning styles and communication, such as individual learning, independent learning, collaborative learning, exchange programs by students, and evaluation between students increased. The interactions between students became positive and matured. Such relation was also observed in teachers work on school affairs. The relation between mailing lists and their meeting style was similar. ICT functioned as a catalyst, but new learning paradigm also facilitated ICT use like a catalyst. While the interviews suggested there were various dynamisms and processes when they became catalysts, any real observation had not been done.

Evidence in support of the rival hypothesis

It was also suggested that constructing environments in which catalysts function effectively is essential. In this meaning, the rival hypothesis was also supported.

Hypothesis 2:

The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995). The rival hypothesis is that technology functions differently from traditional innovations and that therefore different diffusion patterns occur.

Under the leadership of the vice-principal, the teachers who had necessity and motivation gathered spontaneously, shared roles in putting the right teacher in the right place, and the school innovation was promoted.

The pressure from the environments was also important. The vice-principal said, The point of more efficient and effective introduction of ICT into school is how many objectives and tasks that are not realized without using ICT can be created. The environments in which they cannot do without ICT use are necessary; those in which they can do more conveniently if they use ICT are insufficient. In the former environments, teachers cannot help using ICT and induce them various new ideas and improvements.

For the innovation, the organization of supporters, such as PTA and college researchers, was also necessary. Especially when they tried to start a new project, collaboration with professionals in universities and community was indispensable. As they planned to connect home computers with the servers at school, support from parents was also indispensable. At home, some parents learned ICT use from their children.

Evidence in support of the main hypothesis

Interviewees reported that the vice-principal and a few teachers, that is, the limited number of leaders, introduced ICT and other innovations. However, there were no clear evidence on the process of the diffusion.

Evidence in support of the rival hypothesis

No clear evidence.

Hypothesis 3:

Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning. This hypothesis assumes that teachers mediate ICT applications when they are successful, and that ICT's academic value relates positively to teacher competence. The rival hypothesis is that the school technological infrastructure and student ICT competence rather than staff competence determine ICT implementation outcomes.

Various supports were prepared for teachers to learn how to use ICT in advance of students or at the same time. At the beginning, however, the relation between such measures and ICT applications into all the school was not clear. In the various aspects of ICT introduction, the leadership by the vice-principal was outstanding. He started the reformation of teachers' consciousness from 1999 and moved to digitization of their office works.

Evidence in support of the main hypothesis

No clear Evidence.

Evidence in support of the rival hypothesis

No clear Evidence.

Hypothesis 4:

Gaps in academic performance between high and low poverty students will not increase when all students have equal access to ICT. The rival hypothesis is that equal access to ICT will lead to more advantaged students increasing the performance gap with disadvantaged (high poverty) students.

The relation between academic performance and ICT accessibility was more complicated. They found an advantaged student had poor performance on ICT use, and that a disadvantaged student noticed and developed his/her hidden abilities. The financial background also had no relations, but each learner's motivation was the principal factor for ICT use.

Evidence in support of the main hypothesis

No clear evidence.

Evidence in support of the rival hypothesis

No clear evidence.

Hypothesis 5:

Successful implementation of ICT will lead to the same or higher academic standards in spite of the low quality of many ICT materials. Academic standards are a function of teacher and school expectations and not of the standards of textbooks, ICT materials, and the like. The alternative hypothesis is that ICT use will lead to a lowering of academic standards as students spend more time on marginally beneficial searches and in browsing poor quality Web and courseware content.

Evidence in support of the main hypothesis

No clear evidence.

Evidence in support of the rival hypothesis

No clear evidence.

5. Projection to the future:

The Junior High School, attached to School of Education, Gifu University has succeeded in utilizing ICT in various aspects of all the school. In addition to computer classrooms, all of classrooms had a couple of computers connected with LAN, and students could use it anytime and anywhere. ICT also changed the teachers' works considerably in terms of the reduction in the number of school conferences, and of the sharing and accumulation of information on the teaching and school affairs. The practices were more innovative comparing with those in other schools that had not implemented the use of ICT in daily activities yet.

The school understood their next step would be to expand the environments for flexible learning out of the school, that is, at home. Use of ICT will also bring about collaboration of teachers with parents and supports from the community, both of which are expected in the next Requirements for Guidance in Learning (national standard curriculum). It was one of the innovative points in this school that not only teachers and students but also parents can use ICT. In order to raise the ratio of households of home computer with access to school to 100%, the school planned to qualify its household as a requirement for the entry to the school from FY2001. The new challenge will be expected to sustain in this school in expanding its scale.

At present, the government strongly promotes the introduction and advancement of ICT use in all of Japanese schools, and many schools can find easily financial supports. However, to transfer such innovation to other schools, various additional conditions should be satisfied. This case study found that the leadership of the vice principal was one of the most essential factors in the reform in this school. It is suggested that the allocation of experienced leaders to schools and organizational cultivation of them are indispensable for the transfer of ICT use, in addition to teacher training.

6. Appendix A:

Four researchers participated in the data collection. The team spent almost all of three consecutive days. The team had interviewed the principal, one IT coordinator of the school, one IPPUT teacher, three regular teachers, students, and parents. Each interview had lasted about one hour, sometimes two hours. In addition, documents such as a booklet of the school, several reports of project were collected. An ordinary classroom lesson using ICT was recorded by video.

Table A-1: Schedule of Interview

Interviewee	Date	Duration	Condition
Principal	30/Jan/2001	ca. 120 min.	
Innovation Teacher 1	31/Jan/2001	ca. 50 min.	
Innovation Teacher 2 (in charge of IT)	30/Jan/2001	ca. 50 min.	
Other Teachers (3 persons)	29/Jan/2001	ca. 50 min.	Group Interview
Students (Class 4 of 9 th Grade)	29/Jan/2001	ca. 50 min.	Group Interview
Parents (3 persons)		ca. 50 min.	Group Interview

7. Appendix B: Tables for Teacher ICT Practices Survey

How comfortable are you with using a computer to do each of the following? (Choices are: very comfortable, comfortable, somewhat comfortable, not at all comfortable)

		very comfortable	comfortable	somewhat comfortable	not at all comfortable
1	write a paper	14	8	1	1
2	search for information on the World Wide Web (WWW)	12	7	3	2
3	create and maintain web pages	2	3	5	14
4	use a data base	4	6	9	5
5	develop a data base	2	3	7	12
6	send and receive e-mail	15	7	2	0
7	write a program	2	2	3	17
8	draw a picture or diagram	5	8	5	6
9	present information (e.g., use PowerPoint or equivalent)	9	9	5	1

How important is each of the following computer-related skills for your teaching? (Choices are: very important, important, so-so, and not important at all)

		very important	important	so-so	not important at all
10.	write a paper with a word processor	13	6	5	0
11.	search for information on the WWW	12	9	3	0
12.	create Web pages	1	7	10	6
13.	use a data base	3	9	9	3
14.	develop a data base	1	8	9	6
15.	send and receive e-mail	6	8	8	2
16.	write a program	2	2	11	9

17.	draw a picture or diagram with a graphing/drawing application	3	13	7	1
18.	present information (e.g., use PowerPoint or equivalent)	6	13	5	0

During the past school year, how often did your students on average do the following for the work you assigned? (Choices are: several times each week, several times each month, a few times, never)

		several times each week	several times each month	a few times	never	No answer
19.	use the World Wide Web	4	10	7	3	0
20.	create web pages	0	2	6	15	1
21.	send or receive e-mail	1	4	8	11	0
22.	use a word processing program	1	11	5	7	0
23.	use a computer to play games	0	4	5	15	0
24.	use a spreadsheet	0	3	6	15	0
25.	use a graphics program	0	0	8	15	1
26.	join in an on-line forum or chat room	0	2	3	19	0
27.	use a presentation program (e.g., PowerPoint)	2	9	8	5	0
28.	use an instructional program (including simulations)	3	4	4	12	1
29.	other computer uses (specify)	0	2	3	18	1

30. How would you rate your ability to use a computer? (Choices are: good, fair, poor)

		good	fair	poor	No Answer
30.	ability to use a computer	2	19	0	3

Answer questions 31-38 based on experiences or policies from the last school year.

31. Was student computer use ever evaluated for grading? (yes-no)

		yes	no
31.	evaluated for grading	5	19

32. If you assigned World Wide Web searching, how much freedom did you allow students in locating sites to visit? (no restrictions, some restrictions, designated sites only)

		no restrictions	some restrictions	designated sites only	no answer
32.	how much freedom did you allow students in locating sites to visit?	4	14	4	2

33. Did you create or modify a Web site with any of the classes that you taught? (yes-no)

		yes	no
33.	Did you create or modify a Web site with any of the classes that you taught?	3	19

34. What portion of the computer use in your classes was directly related to the course content? (all, most, some, very little)

		all	most	some	very little
34.	What portion of the computer use in your classes was directly related to the course content?	4	6	9	4

35. What portion of the computer use that you assigned was done by students individually? (all, most, some, very little)

		all	most	some	very little
35	What portion of the computer use that you assigned was done by students individually?	2	10	4	7

36. If you have a computer at home, how often did you use it for preparing for teaching? (several times a week, several times a month, a few times, never, no computer)

		several times a week	several times a month	a few times	never	no computer
36	If you have a computer at home, how often did you use it for preparing for teaching?	7	4	8	5	0

37. Did you participate as a student or instructor in a virtual course through the Internet/World Wide Web? (yes-no)

		yes	no
37.	Did you participate as a student or instructor in a virtual course through the Internet/World Wide Web?	1	23

38. Did you involve your students in collaborative learning over the Internet/World Wide Web with students from other classes? (yes-no)

		yes	no
38.	Did you involve your students in collaborative learning over the Internet/World Wide Web with students from other classes?	3	21

39. Are you currently using technology to collaborate with other teachers (professional chat rooms, forums, or the like)? (yes-no)

		yes	no
39.	Are you currently using technology to collaborate with other teachers?	1	23

40. How many e-mail messages do you send each week on average? (more than 12, 6-11, 1-5, none).

		more than 12	6-11	1-5	none
40.	How many e-mail messages do you send each week on average?	14	6	4	0

How many of the following have you ever done?

	Frequency									
	0	1	2	3	4	5	6	10	11 or more	Many
41. made changes to a computer s hardware	16	2	1	0	2	1	1	0	1	0
42. updated an application program (word processor, graphics program, etc.)	10	1	3	2	1	2	0	1	2	2
43. recovered a damaged file	15*	3	2	0	0	1	0	1	1	
44. created a web site	14	1	4	0	0	0	0	2	1	2
45. developed a data base	19	1	0	1	0	1	0	1	1	0

* contains a response saying cannot