

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

## A Case Study of ICT and School Improvement at Fuchinobe Elementary School, Sagamihara, Japan

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### Daily Use of ICT in Every Grade of a Primary School

#### Investigators

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#### 1. Overview

A student of the sixth grade said, I was able to know better about my surroundings and the world , I can study quickly the matters that I am just interested in , and I want to communicate more with friends around the world . All of the sixth graders at the Fuchinobe Elementary School were able to study and confirm their questions using computers and the Internet, and to communicate with people inside or outside of the school without difficulties using their web pages and E-mail. These were because the students had used ICT in their everyday life since the first grade. Comparing with most of Japanese elementary schools, in which students have not used ICT every day, Fuchinobe Elementary School is still a special case.

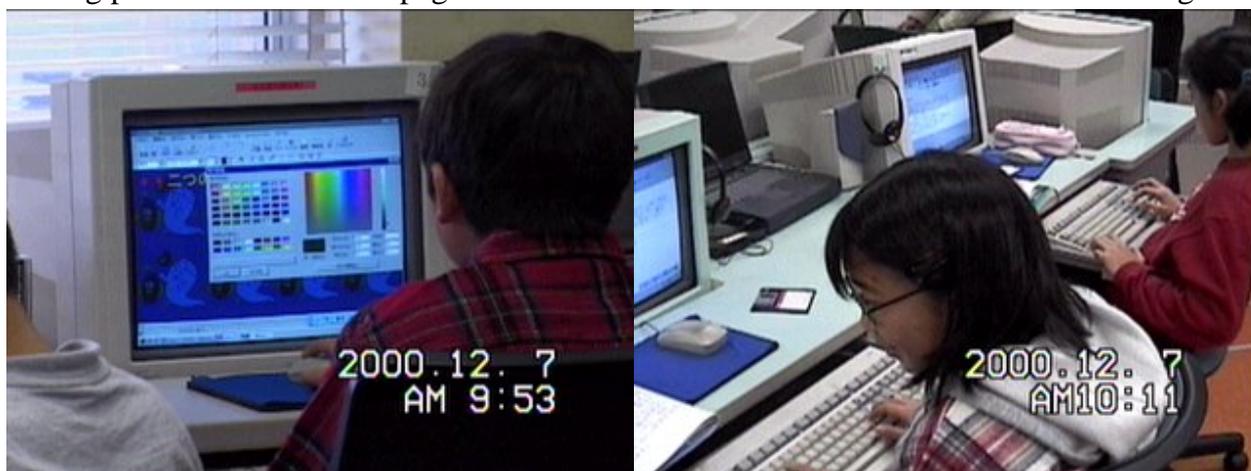


Left; a girl of the second grade was drawing a picture which was used in a writing task.

Right; a pupil was waiting for the output of his/her work in front of the printer.



Taking photos for their homepage: house of milk cartons on the roof of school building



The sixth graders were making a homepage about the history of Japan.



From the interviews. Left; interview to parents of the fourth graders. Right; that of a lecturer of international exchange class.



Left; a girl was making Christmas cards to send to overseas students in an international exchange class. Right; developing homepages in the social studies of the sixth grade.

One of a fourth grader's parents understood various challenges of this school positively, saying the challenges of the school can be seen on the school's homepage, Fuchinobe elementary school has better ICT environments than other schools, parents could enjoy with students' activity on CM making in which their child also worked hard, and their child has more knowledge in various points than us.

In the activities in Kids Link project, students studied and elaborated various points to exchange Christmas cards with students in 40 and more countries. As a result, they could communicate with overseas students, and got sufficient satisfaction. Such learning activities were not realized without ICT.

A teacher who had experienced the effectiveness of ICT use told, The first difference that students noticed whilst exchanging information with overseas children was that in various scales. While they looked up inch and pound by themselves, even teachers had great difficulties in understanding a unit of weight when a recipe of cake was sent from Slovenia. The school sports day was unfamiliar to many overseas students while the Japanese students believed normal. They could not understand how we spent all day outside. The geographical distances between the countries felt reduced through such communication.

The principal said, Our school participated in Frontier School Project managed by Sagami-hara City as the first of 53 schools in this area in 1988. At that time, the use of computers had just started in Japanese schools. Under the collaboration with the city educational committee, we changed the viewpoint of teaching from teacher-centered to pupils-centered and promoted research for improvements in our school. We challenged various advanced innovations in keeping the children's perspective and succeeded to introduce them in everyday learning activities.

By using ICT everyday, they became to utilize it not only in classrooms but in other activities and works. The principal utilized it to collect educational information for school management, and teachers used it for lesson study both in school and at home.

## 2. Past

Sagami-hara City is one of the most advanced areas in the Kanto region in its educational use of ICT. The city has installed a minimum of 40 PCs in each of 80 primary and junior high schools, and challenged various innovations. The Fuchinobe Primary School was the first primary school that was designated by the city as a Frontier School of Teaching and Learning with ICT in 1986. The school played a leading role in the use of ICT and implemented a variety of innovative practices.

The Fuchinobe Primary School had started another innovative challenge which is called with Challenge Time in 1997. It was related to integrated study in which every pupil found each goal and studied on the topics as an individual research. Such learning activities were not common in Japanese primary schools at that time. This challenge was sophisticated in annual curriculum from 1998.

## 3. Present:

The Fuchinobe Primary School consisted of 39 teachers and 1003 students.

In the computer room, they had 21 desktop PCs and 20 laptop PCs. In addition, 20 laptop PCs were distributed to the classrooms of the 6<sup>th</sup> grade, a printing room, and the principal's office. Twenty-two color printers, two laser printers, a scanner, ten digital cameras, and 2 digital video cameras were also used. From the beginning of the second term, the first-grade students started to learn how to utilize PCs and information for an hour per week. At the 3<sup>rd</sup> and 4<sup>th</sup> grade, students were involved in solving problems in groups, and at 5<sup>th</sup> and 6<sup>th</sup> grade, students conducted their individual studies on each topics using ICT and field research. Teachers were also involved in learning activities using ICT daily in the Point TT system . Students of the 3<sup>rd</sup> and 4<sup>th</sup> grade worked outside the framework of the classroom, and 5 or 6 teachers were engaged in guidance and support on topics for them. Students of the 5<sup>th</sup> and 6<sup>th</sup> grade were guided and supported by more than twenty teachers. In addition to eight teachers of 5<sup>th</sup> and 6<sup>th</sup> grade, both ten teachers of 2<sup>nd</sup> grade and teachers of Arts and Music supported their activities. This school developed the special support system called with Point TT system . In this system, teachers were distributed to keep the progress of their learning, and to respond more adequately to the students' topics and requests. Regional experts in the community were also invited as guest teachers to guide and support for their learning. This was an example of the collaboration of the school and the community.

In terms of transmission of information, each student of the 5<sup>th</sup> and 6<sup>th</sup> grade had their own homepage in which they displayed information they had found, and notified others when they had confronted with difficulties for their further progress, requested responses and thus kept the transmission of information. No students appeared to have problems in creating their own homepages.

#### 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.*

##### **Evidence in support of the main hypothesis**

1) Once each month, Fuchinobe Primary School used a free-study time as a Pasocon Time (Personal Computer Hours ), and all students of Grade 1-6 learned how to use PCs and the Internet. In Challenge Time (the periods for Integrated Study) , Grade 3-4 students found a theme in groups, investigated it and reached a solution. Grade 5-6 students did it individually, and completed as a graduation project. In February of the final year, each student presented his/her own project, and reflected and summarized in March.

After a period of preparation, the curriculum for Grade 3-4 students was designed to ensure that they are able to solve problems by themselves. This is designed to improve the quality of the students in the long-term.

These changes could not be achieved without the use of technology. 292 of Grade 5-6 students studied different topics in 2000, and it was impossible to collect sufficient information and to hold it in the library. Information obtained from electronic sources was accumulated and processed efficiently toward the presentation in February. Teachers were able to neither monitor the progress nor give appropriate advices without using e-mail. Each student also had to use ICT to accomplish their tasks in the limited time. ICT was therefore essential for this innovative challenge.

##### **Evidence in support of the rival hypothesis**

No clear evidence.

##### ***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.*

#### **Evidence in support of the main hypothesis**

No clear evidence.

#### **Evidence in support of the rival hypothesis**

When the first graders learned how to use computer, students of the 6<sup>th</sup> grade sometimes supported their training as tutors. Such learning style provided different processes of learning, comparing with those by teachers. Both such activities by students and those by volunteers in the community were the teaching methods that had not been used in conventional public education. The reasons that this school could adopt such innovative teaching methods were that the content to teach was just new and that teachers easily understood they themselves needed helps.

#### ***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.*

#### **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.*

#### **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 positive and subjective approach to learning, associated with Challenge Time (periods for integrated

study) and ICT use, had a desirable influence on daily learning in all subjects. This point was confirmed in the interviews of the information coordinator and the school principal.

### 5.1 Continuity of innovative practices

The Fuchinobe Primary School had implemented Challenge Time in 1997, and accumulated four years of experience in this concept. It functioned to familiarize students with the use of ICT, while at the same time firmly establishing a path throughout the six years of primary school, from solving problems in groups by 3<sup>rd</sup> and 4<sup>th</sup> graders, to individual activities by 5<sup>th</sup> and 6<sup>th</sup> graders.

### 5.2 Possibility of transfer to other schools

There are number of difficulties in relation to the transfer of these innovative practices to other schools. As this school had more than 1000 students and 39 teachers, the size of this primary school should be considerable. It is difficult to provide enough teachers to meet with the needs of 5<sup>th</sup> and 6<sup>th</sup> grade students in their individual projects. If the system is to be implemented only in 6<sup>th</sup> grade students, it may be transferable to other schools, however it is difficult to provide the continuous effort in raising the quality of students in a program beginning in 1<sup>st</sup> grade and continuing to the research by individual students in 6<sup>th</sup> grade. Even the introduction into daily activities of ICT alone is a task not easily achieved in other general schools; however the full implementation of the new teaching requirements in 2002 may result in an increase in the number of schools engaged in such program.

### 5.3 A paradigm shift to lifelong education

In higher grades, students at Fuchinobe Primary School improved their abilities to learn by themselves. Group interviews with the students showed an increased ability to solve problems to some extent. The abilities to make a plan, to implement it, and to modify it, and that to get solutions on their project were considered to develop higher than the average in Japanese schools. In the 6<sup>th</sup> grade, most of students got to send information obtained from web sites, to present information, and to produce the appropriate material. Students also reached to high level in terms of use of ICT as well. It was expected that such development are effective on later learning at junior high school and further education.

## 6. Appendix A: Methodology:

### 6.1 research team

Category	Name	Organization
RESEARCHER	Hidetsugu HORIGUCHI	National Institute for Educational Policy Research
	Kanehisa YAMADA	National Institute for Educational Policy Research
	Ryoei YOSHIOKA	National Institute for Educational Policy Research
COLLABORATORS	Takayuki TSURU	Teacher, Inazumi Elementary School, Toyama Prefecture
	Takeshi URA	Teacher, Miyata Elementary School, Toyama Prefecture

### 6.2 Schedule of Interview

Date	Time	Number of Interviewee
07/DEC/2000	11 hours (8am-7pm)	5
08/DEC/2000	11 hours (8am-7pm)	5
11/DEC/2000	4 hours (unknown)	1

### 6.3 Materials collected or recorded

Category	Content	Volume	Condition
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Video	Recording of a classroom (2 <sup>nd</sup> Grade) and posters in corridor	1 hour each	1 <sup>st</sup> Angle: Fixed 2 <sup>nd</sup> Angle: Movable
Video	Recording of a classroom (4 <sup>th</sup> Grade)	1 hour each	1 <sup>st</sup> Angle: Fixed 2 <sup>nd</sup> Angle: Movable
Video	Recording of a classroom (6 <sup>th</sup> Grade) and short breaks between lessons	1 hour each	1 <sup>st</sup> Angle: Fixed 2 <sup>nd</sup> Angle: Movable
Video	Recording of a classroom of international exchange	1 hour each	1 <sup>st</sup> Angle: Fixed 2 <sup>nd</sup> Angle: Movable
Video	Recording of an interview to parents	1 hour	
Video	A copy of TV program, , entitled with On the Milky way	1 hour	introducing activities of international exchange programs by this school and Sagamihara City
Audio	Interview: the principal	90 min	
Audio	Interview: Information Coordinator	60 min	
Audio	Interview: IPPUT teachers	60 min	
Audio	Interview: non-IPPUT teachers	60 min	
Audio	Interview: Students	60 min	
Audio	Interview: Parents	60 min	
Printed Materials	School Handbook	12 pages	
Book	Fuchinobe E-School: Launching Integrated Study using the Internet	140 pages	Meiji Publishing Co., Ltd. (2000) in Japanese
Paper	Report of a practice of Integrated Study : Dream for constructing Insect Kingdom		Educational Technology for 4 <sup>th</sup> Grade (Shogakukan Publishing Co.,Ltd.) (2000.12)
Article	Integrated Study : Seeking individual learning task based on each student s interests		Education and Home News ( Kyoiku Katei Shimbun ) (2000.11.4)
Articles		9 pieces	

### 7. Appendix B: Tables for Teacher ICT Practices Survey

The number of respondents was 27. The figures in the following tables showed the percentages except the cells of frequency.

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	33	19	41	7
2	search for information on the World Wide Web (WWW)	19	22	37	22

3	create and maintain web pages	0	4	34	62
4	use a data base	7	19	37	37
5	develop a data base	0	7	11	82
6	send and receive e-mail	11	22	30	37
7	write a program	0	0	11	89
8	draw a picture or diagram	4	26	26	44
9	present information (e.g., use PowerPoint or equivalent)	4	7	11	78

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	7	26	48	19
11.	search for information on the WWW	4	33	33	30
12.	create Web pages	4	4	33	59
13.	use a data base	4	15	41	41
14.	develop a data base	0	11	30	59
15.	send and receive e-mail	0	11	41	48
16.	write a program	0	4	26	70
17.	draw a picture or diagram with a graphing/drawing application	0	22	52	26
18.	present information (e.g., use PowerPoint or equivalent)	0	19	26	55

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
19.	use the World Wide Web	11	22	26	37
20.	create web pages	0	11	22	63
21.	send or receive e-mail	0	0	33	67
22.	Use a word processing program	4	4	26	63
23.	Use a computer to play games	7	33	37	22

24.	use a spreadsheet	0	4	11	85
25.	use a graphics program	4	15	41	41
26.	Join in an on-line forum or chat room	0	0	0	100
27.	Use a presentation program (e.g., PowerPoint)	0	0	11	89
28.	Use an instructional program (including simulations)	0	7	52	41
29.	other computer uses (specify)	0	19	4	70

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

		Good	fair	poor
30.	ability to use a computer	44	33	7

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	4	96

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
32.	how much freedom did you allow students in locating sites to visit?	59	11	11

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?	19	78

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?	26	30	30	15

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?	67	22	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?	15	22	33	22	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?	4	96

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?	4	96

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?	4	96

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?	11	11	7	67

How many of the following have you ever done?

41. made changes to a computer s hardware

	Frequency
0	23
1	1
5	1
8	1
10	1

42. updated an application program (word processor, graphics program, etc.)

	Frequency
0	18
1-2	3
3	2
4	1
15	1
20	1
100	1

43. recovered a damaged file

	Frequency
0	25
10	2

44. created a web site

	Frequency
0	10
1	10
3-4	4
5	3

45. developed a data base

	Frequency
0	21
1	4
2	1
10	1