

Usage of ICT in Public Schools in Toyama, Japan—A Regional Analysis of ICT Resources Used in Classrooms from the Perspective of Teachers

Aldo Arturo DÁVILA HUERTO, Haruo HASEGAWA

〔資料〕

Usage of ICT in Public Schools in Toyama, Japan—A Regional Analysis of ICT Resources Used in Classrooms from the Perspective of Teachers

Aldo Arturo DÁVILA HUERTO*, Haruo HASEGAWA

ABSTRACT

This study analyzes the pedagogical use of information and communication technology (ICT) resources by teachers in public schools in Toyama, Japan. The main results demonstrated a positive impact of the use of ICT and the Internet. Furthermore, it was found that ICT is significantly beneficial for student motivation. In addition, the use of ICT improves capacity building in students. However, due to a lack of training and equipment in schools, teachers face various problems when using ICT. Therefore, the implementation of ICT in schools in Toyama has been well developed, but there are aspects that still need to be improved to reach an effective integration of ICT.

Keywords : Information and Communication Technology (ICT), Internet, Motivation, Capabilities, Public Schools

1. INTRODUCTION

Technology, specifically information technology, cannot be kept out of the education system, especially in an era in which technological advances are ubiquitous (Friedman, 2005). Considering the benefits and changes that technology has brought in other fields (e.g., banking, e-commerce, communication), educators in Japan and around the world have been researching and discussing the use of technology in teaching and learning activities. The integration of technology in education is considered a key reform. Japan has introduced important policies for the integration and use of Information and Communication Technology (ICT) in schools to provide equal opportunities for all students. The introduction of ICT in Japanese education was documented in the First Report of the National Council on Educational Reform in 1985, which dealt with the information of education, whereas the latest ICT-related initiative, The Vision for ICT in Education—Towards the Creation of a Learning System and Schools Suitable for 21st Century (2011), is a comprehensive policy on the utilization of ICT in education toward 2020.

Trends and current issues in the use of ICT in Japanese education documented in Future Schools Promotion Project (Ministry of Internal Affairs and Communications, 2013) center around two points:

(1) The effectiveness of computerization in education has been globally proven. In a study of ICT utilization, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) found that scores were higher on objective tests in ICT-utilized classrooms

than in those without ICT, and that pupils' knowledge, understanding, and motivation to learn were enhanced. Moreover, it has been demonstrated that classroom ICT utilization raises teacher-pupil bidirectionality, promotes inter-pupil collaboration in learning new materials, and increases the teacher's opportunity to provide "personalized teaching."

(2) In Japan, computerization in classrooms is trailing behind many countries. In the top-performing countries in the Program for International Student Assessment (PISA), computerization in classrooms is pursued on a wide scale. The Japanese level of ICT utilization is the lowest among them.

These considerations are based on large projects, such as the aforementioned Future Schools Promotion Project, that have exhibited positive results, with improvement in the ICT skills and leadership of teachers and a positive response from students in their interest in the class, learning motivation, and behavior. A new initiative by Fujitsu, Learning Project of Tomorrow (Fujitsu Limited, 2014), envisions an era in which every student has a tablet. It aims to create a diffusion model to disseminate ICT expertise for lessons and propagate its practical advantages and applications.

In this context of abundant information and interest in technology, with ICT improving the quality of learning (Kageto, 2007), this research is conducted from a regional and specific perspective, analyzing the characteristics and issues of ICT resources and their use in classrooms.

* Teacher Training Program Student at Graduate School of Human Development, University of Toyama (2014)

2. PURPOSE

This research analyzes the use of ICT resources in public school classrooms in Toyama, Japan from the teaching perspective. In order to achieve this primary goal, the following objectives were set: (1) identify the type of ICT resources used by teachers, (2) determine the usage frequency of ICT resources, (3) analyze the ICT activities teachers conduct in classes, (4) determine the degree of influence of ICT on motivation and capacity building of students, and (5) identify the problems that emerge from the use of ICT.

3. METHOD

The research was carried out with a quantitative approach and transactional descriptive design. Due to the nature of the study, principles of purposive sampling and convenience according to non-probabilistic methods were used for selecting participants sampling. A sample of 29 public school teachers from Toyama Prefecture was used: 13 from elementary schools, eight from junior high schools, three from high schools, three from special needs schools, and two from professional schools. It must be clarified that the sample members had a particular interest in the use of ICT in the classroom. Data was collected through a questionnaire administered to participants in person and via email (only to high school teachers). The information was processed according to the principles of descriptive statistics, and statistical tables and graphs were developed using MS Excel.

4. RESULTS

The study results were grouped into three main categories: (I) the usage and purpose of ICT, (II) the impact of ICT on learning, and (III) the problems/limitations during the use of ICT. These results will be treated in detail in the following sections.

4.1 THE USAGE AND PURPOSE OF ICT

Responses collected from participants through questionnaires were grouped into five subcategories: (1) ICT resources used in the classroom, (2) usage of the Internet in the classroom, (3) subjects in which ICT is used, (4) ICT activities, and (5) purpose of using ICT.

4.1.1 ICT resources used in the classroom

All participants responded that they use more than one ICT resource in the classroom. Of the 11 items under survey (notebook PC, CD player, camera, projector, TV, tablet, video camera, digital board, DVD player,

desktop computer, and radio), each resource is used by at least one teacher.

Table 1 is a detailed presentation of the resources that are most frequently used according to the levels of education. Thus, in elementary schools, notebook PCs and CD players are most frequently used with a common average score, 3.00; in junior high schools, projectors show more usage (mean score, 2.75); in high schools, CD players are used more (mean score, 3.00); in special needs schools, digital boards are used more (mean score, 3.67); and in professional schools, tablets are the most frequently used item (the highest average score, 4.00).

Overall, regardless of the school level, the following are the five most commonly used resources: (1) notebook PC and CD player, both with the same score of 2.66; (2) projector (2.55); (3) camera (2.34); (4) tablet and TV, both with the same score of 2.28; and (5) radio, with the lowest score of 1.03, which would mean that it is practically no longer used by teachers. Professional school teachers stated that they occasionally use radios, whereas other schools rarely use it.

4.1.2 Usage of the Internet in the classroom

Table 2 shows that 19 teachers (66%) use the Internet in class but 10 teachers (34%) do not. With respect to the frequency of use, six teachers (21%) use the Internet two to three times a week, two teachers (7%) use it once a week, another two (7%) use it two to three times a month, four teachers (14%) use it once a month, and five teachers (17%) use it in other situations. These situations, however, depended on the availability of proper equipment, good Internet signal and the need of the Internet for the purpose of the class.

4.1.3 Subjects Using ICT

Teachers use ICT in all areas of study, as can be seen in Table 3. However, they prefer to use ICT in some subjects over others. Elementary schools use ICT the most in Japanese language classes, junior high schools use it the most in moral classes, high schools use it only for English classes (3 respondents are all English teachers), and in special needs schools, there is no prominent subject that stands out.

In total, Japanese language and mathematics involve the most ICT for all schools, followed by science and social studies.

Although they are not areas of study, extracurricular activities and morning meetings involve ICT because they are also learning spaces.

TABLE 1. FREQUENCY OF USE OF ICT RESOURCES

ICT Resources	Type of School	Number of Teachers	4	3	2	1	Average	Standard Deviation
Notebook PC	Elementary School	13	7	2	1	3	3.00	1.24
	Junior High School	8	0	4	2	2	2.25	0.83
	High School	3	1	0	1	1	2.33	1.25
	Special Needs School	3	0	0	2	1	1.67	0.47
	Professional School	2	2	0	0	0	4.00	0.00
	Total	29	10	6	6	7	2.66	1.18
CD Player	Elementary School	13	8	0	2	3	3.00	1.30
	Junior High School	8	2	0	2	4	2.00	1.22
	High School	3	2	0	0	1	3.00	1.41
	Special Needs School	3	0	2	0	1	2.33	0.94
	Professional School	2	1	0	1	0	3.00	1.00
	Total	29	13	2	5	9	2.66	1.32
Projector	Elementary School	13	5	1	5	2	2.69	1.14
	Junior High School	8	2	3	2	1	2.75	0.97
	High School	3	2	0	1	0	3.33	0.94
	Special Needs School	3	0	0	2	1	1.67	0.47
	Professional School	2	0	0	0	2	1.00	0.00
	Total	29	9	4	10	6	2.55	1.13
Camera	Elementary School	13	4	4	3	2	2.77	1.05
	Junior High School	8	0	3	2	3	2.00	0.87
	High School	3	0	0	1	2	1.33	0.47
	Special Needs School	3	1	1	1	0	3.00	0.82
	Professional School	2	0	0	1	1	1.50	0.50
	Total	29	5	8	8	8	2.34	1.06
Tablet	Elementary School	13	2	4	2	5	2.23	1.12
	Junior High School	8	1	0	1	6	1.50	1.00
	High School	3	2	0	0	1	3.00	1.41
	Special Needs School	3	1	1	0	1	2.67	1.25
	Professional School	2	2	0	0	0	4.00	0.00
	Total	29	8	5	3	13	2.28	1.28
TV	Elementary School	13	5	4	0	4	2.77	1.25
	Junior High School	8	0	4	2	2	2.25	0.83
	High School	3	0	0	1	2	1.33	0.47
	Special Needs School	3	0	0	0	3	1.00	0.00
	Professional School	2	0	1	1	0	2.50	0.50
	Total	29	5	9	4	11	2.28	1.14
Video Camera	Elementary School	13	0	3	7	3	2.00	0.68
	Junior High School	8	0	2	2	4	1.75	0.83
	High School	3	0	0	1	2	1.33	0.47
	Special Needs School	3	0	1	2	0	2.33	0.47
	Professional School	2	0	0	1	1	1.50	0.50
	Total	29	0	6	13	10	1.86	0.73
Digital Board	Elementary School	13	1	3	1	8	1.77	1.05
	Junior High School	8	0	0	4	4	1.50	0.50
	High School	3	0	0	0	3	1.00	0.00
	Special Needs School	3	2	1	0	0	3.67	0.47
	Professional School	2	0	0	0	2	1.00	0.00
	Total	29	3	4	5	17	1.76	1.04
DVD Player	Elementary School	13	0	2	3	8	1.54	0.75
	Junior High School	8	0	3	3	2	2.13	0.78
	High School	3	0	0	1	2	1.33	0.47
	Special Needs School	3	0	1	0	2	1.67	0.94
	Professional School	2	0	0	1	1	1.50	0.50
	Total	29	0	6	8	15	1.69	0.79
Desktop Computer	Elementary School	13	1	2	1	9	1.62	1.00
	Junior High School	8	1	0	1	6	1.50	1.00
	High School	3	0	0	0	3	1.00	0.00
	Special Needs School	3	0	1	1	1	2.00	0.82
	Professional School	2	1	0	0	1	2.50	1.50
	Total	29	3	3	3	20	1.62	1.03
Radio	Elementary School	13	0	0	0	13	1.00	0.00
	Junior High School	8	0	0	0	8	1.00	0.00
	High School	3	0	0	0	3	1.00	0.00
	Special Needs School	3	0	0	0	3	1.00	0.00
	Professional School	2	0	0	1	1	1.50	0.50
	Total	29	0	0	1	28	1.03	0.18

4 = Always; 3 = Sometimes; 2 = Rarely; 1 = Never

4.1.4 ICT Activities

There are several activities that teachers developed using ICT, which we grouped into 16 macro activities (see Table 4). The use of ICT is higher in the following five activities: displaying knowledge and information (16), displaying pictures, images, draws and graphs (13), displaying videos (12), making videos (9), and displaying guidelines and instructions (8). There are no significant differences in ICT activities developed in

elementary schools, junior high schools, high schools, and others.

We can divide these ICT activities into two groups on the basis of methodology: active learning (students build their learning) and passive learning (students are recipients of information). Within the 16 ICT activities developed by teachers, many fall under the active learning methodology. However, the preference for ICT is higher in passive learning. We noted that of

TABLE 2. USE OF THE INTERNET IN CLASS

Type of School	Number of Teachers	Yes					No
		2-3 a week	once a week	2-3 a month	once a month	others	
Elementary School	13	4	1	2	2	1	3
Junior High School	8	1	0	0	1	3	3
High School	3	0	1	0	0	0	2
Special Needs School	3	0	0	0	1	0	2
Professional School	2	1	0	0	0	1	0
Total	29	6	2	2	4	5	10
19							

TABLE 3. SUBJECTS USING ICT

Subjects	Elementary School	Junior High School	High School	Special Needs School	Professional School	Total
Japanese Language	7	1	0	0	0	8
Mathematics	6	2	0	0	0	8
Science	4	2	0	1	0	7
Social Studies	5	1	0	0	0	6
Physical Education	4	0	0	1	0	5
The Period of Integrated Studies	3	2	0	0	0	5
English	0	2	3	0	0	5
Extracurricular Activities	0	3	0	1	0	4
Art	1	1	0	1	0	3
Moral	0	3	0	0	0	3
Living Environment Studies	1	0	0	1	0	2
Music	2	0	0	0	0	2
Home Economics	2	0	0	0	0	2
Morning Meeting	2	0	0	0	0	2
Lecture	0	0	0	0	1	1
Total	37	17	3	5	1	63

Totals based on respondents 28 valid cases. Elementary School = 13; Junior High School = 8; High School = 3; Special Needs School = 3; Professional School = 1

TABLE 4. ICT ACTIVITIES

ICT Activities	Elementary School	Junior High School	High School	Special Needs School	Professional School	Total
Displaying knowledge and information	7	4	3	2	0	16
Displaying pictures, images, draws and graphs	6	3	3	1	0	13
Displaying videos	4	4	3	1	0	12
Making videos	6	1	1	1	0	9
Displaying guidelines and instructions	6	1	0	1	0	8
Using software	1	2	0	1	0	4
Searching information in internet	3	1	0	0	0	4
Listening to CDs	1	2	1	0	0	4
Using digital textbooks	3	0	0	0	0	3
Taking pictures	2	1	0	0	0	3
Holding discussion	3	0	0	0	0	3
Sharing findings and productions	1	2	0	0	0	3
Using APPs	1	0	0	1	0	2
Watching TV	0	1	0	0	1	2
Making presentations	0	2	0	0	0	2
Evaluating	1	0	0	0	0	1
Total	45	24	11	8	1	89

Totals based on respondents 28 valid cases. Elementary School = 13; Junior High School = 8; High School = 3; Special Needs School = 3; Professional School = 1

TABLE 5. TEACHERS' PURPOSE OF USING ICT

ICT Resource	Type of School	Number of Teachers	4	3	2	1	Average	Standard Deviation
To facilitate the understanding of topics and contents	Elementary School	13	11	2	0	0	3.85	0.36
	Junior High School	8	3	5	0	0	3.38	0.48
	High School	3	2	1	0	0	3.67	0.47
	Special Needs School	2	1	1	0	0	3.50	0.50
	Professional School	2	2	0	0	0	4.00	0.00
	Total	28	19	9	0	0	3.68	0.47
To encourage active participation	Elementary School	13	9	4	0	0	3.69	0.46
	Junior High School	8	4	3	1	0	3.38	0.70
	High School	3	2	1	0	0	3.67	0.47
	Special Needs School	2	1	1	0	0	3.50	0.50
	Professional School	2	2	0	0	0	4.00	0.00
	Total	28	18	9	1	0	3.61	0.56
To make classes more fun	Elementary School	13	10	2	1	0	3.69	0.61
	Junior High School	8	2	6	0	0	3.25	0.43
	High School	3	2	1	0	0	3.67	0.47
	Special Needs School	2	1	1	0	0	3.50	0.50
	Professional School	2	2	0	0	0	4.00	0.00
	Total	28	17	10	1	0	3.57	0.56
To develop ability to create	Elementary School	13	2	8	3	0	2.92	0.62
	Junior High School	8	4	4	0	0	3.50	0.50
	High School	3	0	2	1	0	2.67	0.47
	Special Needs School	2	0	2	0	0	3.00	0.00
	Professional School	2	0	1	1	0	2.50	0.50
	Total	28	6	17	5	0	3.04	0.63
To enhance students' cooperation	Elementary School	13	1	5	6	1	2.46	0.75
	Junior High School	8	0	3	5	0	2.38	0.48
	High School	3	0	2	1	0	2.67	0.47
	Special Needs School	2	0	2	0	0	3.00	0.00
	Professional School	2	0	0	2	0	2.00	0.00
	Total	28	1	12	14	1	2.46	0.63
To enhance a sense of respect among others	Elementary School	13	1	3	7	2	2.23	0.80
	Junior High School	8	0	3	5	0	2.38	0.48
	High School	3	0	1	2	0	2.33	0.47
	Special Needs School	2	0	2	0	0	3.00	0.00
	Professional School	2	0	0	2	0	2.00	0.00
	Total	28	1	9	16	2	2.32	0.66

4 = I really think so; 3 = I think so; 2 = I don't think so; 1 = I don't think so at all

TABLE 6. INCREASE OF STUDENT MOTIVATION THROUGH ICT

Type of School	Number of Teachers	4	3	2	1	Average	Standard Deviation
Elementary School	13	2	11	0	0	3.15	0.36
Junior High School	8	1	7	0	0	3.13	0.33
High School	3	0	3	0	0	3.00	0.00
Special Needs School	3	1	2	0	0	3.33	0.47
Professional School	2	1	1	0	0	3.50	0.50
Total	29	5	24	0	0	3.17	0.38

4 = Greatly increase; 3 = Increase; 2 = Not increase; 1 = Not increase at all

the five most common ICT activities, four fall under the passive learning methodology (displaying knowledge and information; displaying pictures, images, draws and graphs; displaying videos; and displaying guidelines and instructions) and only one under the active learning methodology (making videos).

4.1.5 Purpose of Using ICT

Table 5 presents condensed information on the reasons teachers use ICT in the classroom. We found three main purposes with a high value of acceptance: (1) to facilitate the understanding of topics and contents,

(2) to encourage active participation, and (3) to make classes more fun. These indicators present very close results that cannot be clearly differentiated, even for nominative ratings ("I really think so," "I think so," and "I don't think so"). Therefore, we consider the three purposes as a trilogy. To develop ability to create and to enhance students' cooperation are secondary purposes accepted among teachers. In contrast, using ICT to enhance a sense of respect among others is a purpose with a very low acceptance among teachers.

4.2 THE IMPACT OF ICT ON LEARNING

For better understanding, the results of this section were classified into two subcategories: (1) motivation and ICT and (2) capabilities and ICT.

4.2.1 Motivation and ICT

Table 6 overwhelmingly shows that the use of ICT increases students' motivation (average score of 3.17). The perception of teachers across all surveyed educational levels is that the use of ICT increases students' motivation.

A. Experiences of activities that help in motivation

Many teachers believe that the use of ICT in the classroom (by teachers as well as students) increases the motivation of students. Activities such as watching and taking videos, looking at photos, showing slides, providing assistance to struggling students, performing activities using tablets, sharing experiences and feelings, and holding discussions save time and effort and help guide the students. Of these activities, watching videos and looking at photos have the highest value, and taking videos comes second.

B. Experiences of activities that do not help in motivation

Certain actions or situations do not help student motivation. Teachers have mentioned that the following situations do not help in motivating students: the lack of Internet connection, Internet misuse by students, overcrowded workgroups, overabundance of online information, overreliance on the machine, lack of students' ICT skills, malfunctioning of devices, simple and easy activities that are boring, and the improper use of ICT. The activity with the highest value in this category is the lack of Internet connection.

4.2.2 Capabilities and ICT

According to the data in Table 7, some capabilities significantly improved through the use of ICT. The capabilities improved are given as follows. (1) problem solving capability had the highest average score (3.00). (2) creativity (2.96) and (3) oral communication (2.93) are high average scores. These scores imply that it received the greatest benefit of interacting with ICT. These capabilities are perceived to have improved when using ICT.

4.3 PROBLEMS/LIMITATIONS IN THE USE OF ICT

An extensive list of problems arose when teachers were questioned about the use of ICT. To facilitate

TABLE 7. DEVELOPMENT OF CAPABILITIES BY USING ICT

Capability	Type of School	Number of Teachers	4	3	2	1	Average	Standard Deviation
Problem Solving	Elementary School	13	2	10	1	0	3.08	0.47
	Junior High School	7	1	5	1	0	3.00	0.53
	High School	3	1	2	0	0	3.33	0.47
	Special Needs School	3	0	3	0	0	3.00	0.00
	Professional School	2	0	0	2	0	2.00	0.00
	Total	28	4	20	4	0	3.00	0.53
Creativity	Elementary School	13	3	6	4	0	2.92	0.73
	Junior High School	7	1	5	1	0	3.00	0.53
	High School	3	1	2	0	0	3.33	0.47
	Special Needs School	3	1	1	1	0	3.00	0.82
	Professional School	2	0	1	1	0	2.50	0.50
	Total	28	6	15	7	0	2.96	0.68
Oral Communication	Elementary School	13	1	10	2	0	2.92	0.47
	Junior High School	7	1	3	3	0	2.71	0.70
	High School	3	0	3	0	0	3.00	0.00
	Special Needs School	3	0	3	0	0	3.00	0.00
	Professional School	2	1	1	0	0	3.50	0.50
	Total	28	3	20	5	0	2.93	0.53
Critical Thinking	Elementary School	13	1	6	6	0	2.62	0.62
	Junior High School	7	2	3	2	0	3.00	0.76
	High School	3	0	2	1	0	2.67	0.47
	Special Needs School	3	0	2	1	0	2.67	0.47
	Professional School	2	0	0	2	0	2.00	0.00
	Total	28	3	13	12	0	2.68	0.66
Written Communication	Elementary School	13	0	7	5	1	2.46	0.63
	Junior High School	7	1	1	4	1	2.29	0.88
	High School	3	0	2	1	0	2.67	0.47
	Special Needs School	3	0	2	1	0	2.67	0.47
	Professional School	2	1	0	1	0	3.00	1.00
	Total	28	2	12	12	2	2.50	0.73

4 = Greatly increase; 3 = Increase; 2 = Not increase; 1 = Not increase at all

TABLE 8. FREQUENT PROBLEMS CAUSED BY ICT

Problems	Elementary School	Junior High School	High School	Special School	Professional School	Total
Lack of teaching training	4	5	2	1	1	13
Lack of equipment	6	1	3	0	2	12
Poor Internet signal	4	1	1	0	0	6
Lack of regulations and standards	2	1	1	0	0	4
Lack of technical support	2	0	0	0	0	2
TOTAL	18	8	7	1	3	37

Totals based on respondents 24 valid cases. Elementary School = 11; Junior High School = 7; High School = 3; Special Needs School = 1; Professional School = 2.

better understanding, we have sorted these problems into five main groups according to similarity and unity in their variables: lack of teacher training, lack of equipment, poor Internet signal, lack of regulations and standards, and lack of technical support. Teacher training seems to be the biggest problem, followed by the lack of equipment. These two problems are presented as the most critical issues in the use of ICT at all school levels (see Table 8).

5. DISCUSSION

Based on the results, discussions were grouped into three categories.

5.1 The usage

The different education levels do not agree on a single resource for the best use of ICT. The varying preferences should be studied further to determine the factors that influence the choice of a resource. Across the education levels, the resources most used are notebook PCs and CD players, with the same score as previously mentioned. The preference for notebook PCs among teachers is linked to the positive aspects of portability and flexibility, in contrast to desktop PCs, which are difficult to transport. Classroom activities require portable, flexible, and easy-to-maneuver devices, not just in the classroom but also outside it. The strength of computer-assisted instructions is the variety of actions that can be performed; teachers can virtually develop all ICT activities in their classrooms. CD players also have similar benefits and advantages, such as accessibility, portability, low cost, speed, and ease of use. This raises questions on the effectiveness of the devices in relation to their relevance in the technological world. In this particular case, there are many devices that have replaced CD players, such as computers and tablets. However, the data highlight the importance of CD players in the classroom. The second most preferred resource is projectors, considering the preference of teachers in projecting videos, images, and information. The third

most preferred resource, cameras, is the main input in this specific case for teachers taking photos and displaying them on a screen. The fourth most used resources are tablets and TVs. Tablets are at the forefront of technological devices as they are highly interactive and provide significant benefits according to recent studies. However, few schools are properly equipped with this resource due to their high cost.

TVs, on the other hand, which should be used for live broadcasts and video playback, are used in schools only for playing videos these days. Their use has been limited, and thus, they fulfill the same function as computer screens or projectors.

Internet-assisted instructions, defined as an interactive teaching method, give students access to the global computer network (UNESCO, 2012). Favorable results were obtained regarding the use of the Internet in classrooms, as a large majority (66%) of teachers uses it in the learning processes. This means that integration of the Internet into classrooms is positive, which is manifested in the teachers desiring to further achieve this. However, there is still a large group of teachers who does not use the Internet (34%) because of a lack of Internet connection in schools and inadequate provision of equipment. There is a possibility that the standard of teacher training also influences this figure. Therefore, these problems need to be addressed for the full integration of the Internet into classrooms. However, even with a significant number of teachers using the Internet, the effectiveness of ICT is dampened if it is only used sporadically. Only a small group of teachers (21%) uses it two to three times a week. There is also a group of teachers that uses the Internet only under the right conditions. These conditions are related to connection problems and, especially, the lack of equipment. There is, however, a tendency for teachers to increase the integration of Internet-assisted instructions in classrooms.

Teachers develop a variety of activities in class and demonstrate a willingness to prepare less monotonous and more enjoyable classes that involve the adap-

tation of activities to various situations and the use of a variety of equipment. Conversely, we find that the most commonly used activities utilize projectors. Although the preference for the passive methodology is clear, the active methodology is also present to a lesser degree. In the ranking, this corresponds to making videos (fourth place) in the passive methodology and using software (seventh place) in the active methodology.

In general, most teachers prefer to perform passive activities while teaching. However, subjects like music and physical education develop dynamic and active ICT activities. This dichotomy leads to an argument on the best methodology. This, however, depends on the objectives and purposes of subjects, and each has its own advantages. Teachers need to adopt appropriate teaching methods flexibly while paying attention to both the advantages and limits of ICT (MEXT, 2011).

Teachers have three purposes when using ICT: (1) to facilitate the understanding of a topics and contents, (2) to encourage active participation, and (3) to make classes more fun. Noble purposes are consistent with the current principles of the new pedagogy in which students are active participants in their learning and the classroom is a pleasant and motivating space. However, there is a contradiction in teachers' intentions and actions—the most frequently used ICT activities are passive activities, but their defined purpose is to encourage activism. Such a contradictory choice raises questions.

5.2 The impact

The acceptance of ICT resources by teachers is very important for the effective integration of ICT in schools. Teachers will increase ICT activities in their classrooms if ICT is perceived as a highly motivational resource for students. There are a number of activities that can be conducted using ICT, but the activity of watching videos and looking at photos is the most motivating. There is a willingness among teachers to conduct activities involving multimedia elements. Moreover, the experiences that diminish motivation are related to the lack of Internet connection, equipment, and teacher training. These problems are common around the world.

ICT activities have a positive impact on the development of all abilities, especially problem solving and creativity. It is congruent that students develop the skills to solve problems, because the use of ICT involves constant generation of cognitive conflicts, i.e., it makes students think. The idea that there is also a direct relationship between ICT and creativity is reasonable, considering the important contributions of ICT to the

creative process. Moreover, ICT resources democratize the classroom space, allowing more freedom of expression. It is also important to note that technology alone is not enough to create the desired impact; teachers need to consider a type of pedagogy that works best for the particular content of each lesson (Mishra and Koehler, 2009).

5.3 The problems/limitations

The most prominent problems encountered during the study are lack of teacher training, lack of equipment, and poor Internet connection.

We can assume that the two main limitations are teacher training and insufficient equipment in schools. Although there are policies that promote teacher training, such as The Vision for ICT in Education (MEXT, 2011), the consolidated skills necessary for the effective use of ICT in schools are absent. Diversification, planning, and methodology of the actual use of ICT in classrooms are still ill-formed, resulting in a lack of training for teachers. Therefore, teachers should be trained regularly and effectively. The fundamental motivation for people to adopt and use technology is due to its ease of use and observable results (Davis, 1989). According to studies (Ertmer, 2012; Uslu and Bumen, 2012), an important factor in the failure in integrating technology is the ineffective training programs for in-service teachers. The traditional in-service teacher education programs should be replaced with alternative approaches that are more substantial, contextualized, and pedagogical.

The other issue is the inadequate provision of equipment and budgets in schools. A review of the related literature (Ertmer, 2012; Project Tomorrow, 2011) shows that access to educational resources is a vital factor in the integration of technology. In light of the findings of this study, the content provided through technology affects the attitudes of teachers and students toward the use of technology in teaching and learning.

Another problem, although on a lesser scale, is the lack of Internet connection. It was found that poor Internet connection decreases motivation and interest in students toward using ICT. Johnson (2010) noted that access to online resources plays a key role in technology adoption. Thus, Internet connection is a vital factor in motivating students to adopt ICT in classrooms.

6. CONCLUSIONS

After analyzing, interpreting, and discussing the results, we reached the following conclusions:

1. Teachers in Toyama schools use a variety of ICT

resources, from the most traditional such as CD players to the latest technology, such as Internet-assisted instructions.

2. Teachers' use of ICT in classrooms is occasional, not frequent.
3. The most relevant ICT activities are the projection of information, images, and videos; it is noteworthy that these activities fall under the passive learning methodology.
4. The use of ICT has a positive influence on motivation.
5. The use of ICT improves capacity building (especially problem solving, creativity and oral communication) in the learning sessions.
6. The most relevant problems are the lack of teacher training along with the inadequate implementation of ICT equipment in schools. Even if ICT is used, the proper conditions for its best implementation are not met. It is necessary to enhance teachers' ability to utilize ICT (MEXT, 2011) and implement appropriate equipment; therefore, we urge a review of ICT policies and the implementation of improvement plans to achieve an effective integration of ICT in public educational institutions in Toyama.

REFERENCES

- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), PP. 319–339.
- Ertmer, P. A., Ottenbreit-Leftwich A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, 59(2), PP. 423–435. <http://marianrosenberg.wiki.westga.edu/file/view/ErtmerPTeacherBeliefs.pdf>
- Friedman, T. L. (2005). *The world is flat: A brief history of the twenty-first century*. New York, NY: Farrar, Straus, and Giroux.
- Fujitsu Limited (2014). "Learning Project of Tomorrow" for an Era in Which Every Student Has a Tablet. <http://www.fujitsu.com/global/about/resources/news/press-releases/2014/1016-01.html>
- Johnson, L., Levine, A., Smith, R., & Stone, S. (2010). *The 2010 horizon report*. Austin, TX: The New Media Consortium. <http://www.nmc.org/pdf/2010-Horizon-Report.pdf>
- Kageto, M. (2007). ICT impact on Education - Effective ICT utilization on lessons. <http://www.oecd.org/edu/ceri/39458760.pdf>
- MEXT (2011). The Vision for ICT in Education- Towards the Creation of a Learning System and Schools Suitable for the 21st Century-. http://www.mext.go.jp/b_menu/houdou/23/04/_icsFiles/afieldfile/2012/08/03/1305484_14_1.pdf
- Ministry of Internal Affairs and Communications MIC (2013). Future School Promotion Project. http://www.itu.int/ITUUD/finance/work-cost-tariffs/events/tariff-seminars/Japan-13/documents/Sess5-2_Future-School_Kobayashi.pdf
- Mishra, P., & Koehler, M., J. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education*, 41(4), PP. 393– 416. <http://files.eric.ed.gov/fulltext/EJ844273.pdf>
- Project Tomorrow. (2011). The new 3 E's of education: Enabled, engaged, empowered-how today's educators are advancing a new vision for teaching and learning. Speak Up 2010. National findings. http://www.tomorrow.org/speakup/speakup_reports.html
- UNESCO (2012). ICT in Education in Latin America and the Caribbean. A regional analysis of ICT integration and e-readiness. <http://www.uis.unesco.org/Communication/Documents/ict-regional-survey-lac-2012-en.pdf>

(2015年 8月31日受付)

(2015年 9月25日受理)