A study for the students under medical treatment in hospital to give a lot of opportunities in class with ICT

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ABSTRACT

We visit hospitals and give lessons to students in a long-term hospitalization based on National Curriculum Guideline of MEXT Japan. The purpose of this study is to investigate how ICT can be used more effectively to help the students to learn. Some of the students stay in hospital all the time, so teachers visit them three times a week to give a 120-minute private class. It's usually difficult for students to lie in bed and concentrate on learning for as much as 120 minutes, because of their bad condition, such as a disorder or chronic disease. The teachers should keep in mind that students learn under restrictive environments. In addition, it is required for teachers to make fully worked-out teaching plans considering their academic ability, motivation to learn, state of student's condition, medical environment, and treatment plan for individual student. This study has been practiced in Obu Special Support School in Aichi Prefecture, Japan

We have set up a hypothesis that ICT provide necessary supplies for students in hospital. Even in hospital, where learning environment is not preferable, we made much account of practical experience for students. In this paper, model lessons were put in practice. Students use the Internet or digital contents using mobile 3G data communication, and they devised ways and means to present the materials they prepared. They also used these digital devices in investigating learning. Touch panels, such as iPad, or projectors were adopted as necessary, too. Through these model lessons, ICT seems of use for students in hospital. However, practical experience must be emphasized as well. ICT should be one of the supplements when teaching in hospital.

Keyword: Visiting Education for children under Medical Treatment

1.1 The definition of teaching in children's hospital

According to the government's report in 1969, there is a suggestion that teachers should visit students in hospital to provide enough educational activities. Later, in 1994, this suggestion was emphasized again, requiring educations appropriate for individual students should be carried out. According to National Curriculum Guideline for Special Support Elementary and Junior High School, teachers' visiting children's hospital should be much effective, and the methods of instructions and teaching systems fully worked-out. It also says teachers need to take account of disability levels of each student; therefore the number of teaching hours can be flexible.

1.2 Visiting students in Obu Special Support School

Since 1976, teachers in Obu Special Support School have been visiting students staying in hospital for a long period of time in Aichi Prefecture. In this visiting style, however, there are some restrictions providing educational activities. They can be classified into three different categories below.

1.2.1 Temporal restriction

In Obu Special Support School, teachers visit students three times a week to give a 120-minute private class, which is not enough to teach every school subject. The number of school hours has been increasing recently in Japan, while it is quite impossible to give more lessons for the students in hospital.

1.2.2 Conditional restriction

Considering physical conditions, it is occasionally impossible to increase the number of class for the student because the situation or characteristics of the disease is different in each student there. Also it is

difficult for some students to keep studying long hours. In their wide category relating to general daily life, they usually have a lot of restrictions, which would lead them to spend monotonous life. We think they need more actual experiences, but they have few chances to find something new. Therefore, their social experiences are not sufficient since they tend to be passive and try to do just what they want and avoid what they dislike.

1.2.3 Spatial restriction

Some of the students in hospital stay lying in bed, so they need to take class there, while the others with mild symptoms go to their classroom to take class. (Figure 1) Teachers should devise the ways and means of teaching and select the content of learning to go with individual student.

2 The importance of learning actual experiences in class

As shown, long-term hospitalization causes the students lack of actual experiences and knowledge. Under many restrictions, however, they can experience a lot of things by devising teaching materials or selecting the content of teaching. Having actual experiences not only makes up for their lack of experience, but also enriches the students in mind.

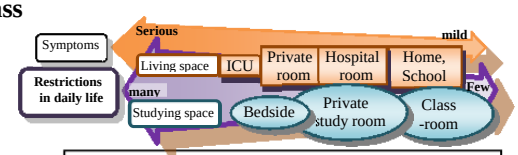

Figure 1 Relationships between symptoms and restrictions in daily life

Then, in 2010, Hasegawa and Fukumoto focused on experiments in science class. They made a study about how active and effective learning can be done for students in hospital, and trying to use ICT devices. They make much account of the students having actual experiences. However, to prevent infectious diseases, they use positively those devices instead.

Of course, ICT devices are not used only for science class. They can be applicable to many subjects, like social studies or life environmental studies, which actual experiences are valued.

3. The purpose of this study

By the reasons mentioned above, we can provide interesting, explicit lessons that students can participate in voluntarily when we utilize ICT devices. In this study, we discuss our opinions on the hypothesis that ICT devices remove restrictions to give class and supplement actual experiences for the students in hospital. Specific ways of learning are verified and reported. Targeted subjects are following: Social Studies, Science, Life Environmental Studies, Independent Activities, and Life-Unit Learning.

4.1 Utilizing ICT devices

4.1.1 Removing spatial restrictions

In Science class, for example, it is difficult for the students in hospital to observe things in nature. It seems that ICT devices can be utilized effectively in this case. However, there are various problems to have class with them in children's hospital. One of the reasons is that it is not desirable to take huge and heavy experimental facilities to hospital. Also, in Social Studies class, visiting libraries or museums, doing fieldworks would be difficult. In this case, ICT devices, such as digital devices should be utilized, based on the situation.

4.1.2 Removing temporal restrictions

Since the total school hour is limited for the students in hospital, ICT devices enable us to save time in the lessons, helping the students to learn the targeted content effectively. In 2010, Hasegawa and Fukumoto gave experimental lessons with Meaningful Reception Learning in a Special Support School. In these lessons, ICT devices made it possible to save time to present or explain the task in the lessons. Also, students could have spent enough time thinking about the experimental results.

4.1.3 Removing restrictions from disability or condition of disease

When utilizing ICT devices, the extent of disability or disease should be taken into consideration. Students with a slight disorder or symptom are able to take lessons like non-handicapped. For the ones with severe situation, on the other hand, it is considered to be quite effective. ICT devices can make the things once impossible possible, when utilized according to the condition of the students. Also it can be concluded that

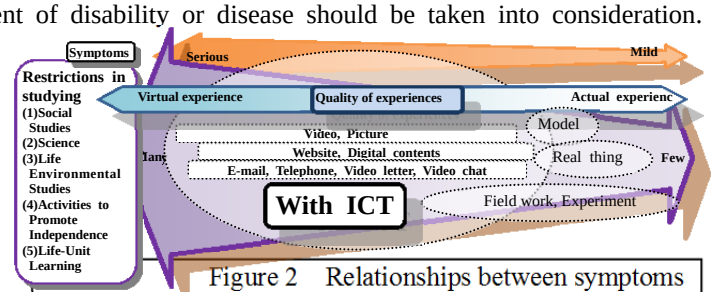

Figure 2 Relationships between symptoms and restrictions in learning or quality of actual experiences

they can compensate for the shortage of having social experiences for the students in hospital. (Figure 2)

4.1.4 Purpose of utilizing ICT devices for students in hospital

National Information Center for Educational Resources classifies the purpose of utilizing ICT devices into 11 groups; in these situations, ICT devices are generally helpful to eliminate temporal, conditional, and spatial restrictions. Then, we have classified those restrictions under following three topics: i) spatial restrictions, ii) temporal restrictions, and iii) disabilities and symptoms. The following (Table 1) is about the purpose of utilizing ICT devices in teaching in hospital. Criterion for valuation is as follows; A: Good enough to eliminate restrictions B: Almost enough C: Not enough.

Table 1 Purpose of utilizing ICT and its actual use for students in hospital

	Purpose of utilizing ICT	Examples of practical ICT utilization	restrictions to eliminate		
			i) spatial	ii) temporal	iii) disabilities and symptoms
1	Introducing the task	Present the latest news picture or an imminent phenomenon with the digital teaching materials and let students discover problems and keep aware of them.	B	B	B
2	Motivating	Utilize ICT as an incentive, showing documents or images that students are interested in.	B	B	A
3	Explaining materials for teachers	Spread and show documents and explain the contents which are selected carefully. Perform the supplement of the textbook. When visiting hospital, devise contents and methods of the presentation in consideration for the actual situation, including the physical condition of the students.	A	A	A
4	Explaining materials for learners	Let the students utilize ICT and show the document for presentation which they made, then let them present in class. However, it is difficult to secure enough time in class in hospital.	B	C	A
5	Establishing images by repeating	Play animations or music repeatedly and establish their images. In class in hospital, it is difficult to secure enough time, but let them utilize them by voluntary learning out of the school hour.	B	C	B
6	Presenting learning models	Show the things that are difficult to show the real ones, such as molecular models, the movement of heavenly bodies or the structure of the inner earth. In class in hospital, it is preferable to show models and figures with the digital teaching materials, considering prevention of infections.	A	B	A
7	Presenting failure examples	Show with the digital teaching materials when it is dangerous or takes a lot of time and cost to show failure examples of the experiment.	B	B	B
8	Recalling experiences	Show pictures and let the students remind the experiences that are common to all of them, such as the movement of moon, the change of the season, or earthquakes.	B	B	B
9	Comparing materials	Compare with digital images when an actual comparison is difficult, such as the color or the form of shield and dome-shaped volcanoes, which can't be taken to class. Compare places or examples that cannot experience directly by hospitalization.	A	A	B
10	Reconfirming the lesson	Let the students recur using the animation which was photographed in the previous lesson.	B	B	B
11	Substituting for actual experiences	Let the students utilize ICT and experience what they cannot experience; not only the things that they can't experience by the hospitalization, but also the things that people usually can't experience, such as outer space or deep in the sea.	A	B	A

5 Practical lessons

Practical lessons with ICT devices were held in Social Studies, Science, Life Environmental Studies, Activities to Promote Independence, Life-Unit Learning class. Targeted members were 11 students who had been in or once belonged to Obu Special Support School. ICT devices were utilized according to the actual condition or learning content of the targeted students. Teachers recorded how they participated in class. Questionnaire method was not used, considering their literacy or descriptive ability for the students in lower classes of elementary schools. For the students with intellectual disability, active participations to the class were recorded, using time sampling method. Evaluations were done by teachers with rating scale method, depending on students' participation to class.

Evaluation criteria are as following: the degree of achievement 1) about the aim for utilizing ICT devices, 2) as actual experiences, and 3) in students' participation. Each criterion was estimated in one of four categories: "A" represents very good, and "B", "C", "D" means good, not enough, poor, respectively.

Additional information were recorded, such as repose, difficulty in moving, danger of infection, lying in bed, difficulty in taking class for long hours due to their medical or physical condition. Choose the applicable classification according to "Purpose of utilizing ICT and its actual use for students in hospital (table 1)" about the purpose of ICT utilization.

The practice result is shown in table 2

Table 2 Practice result

Subject Study area	No.	Student	Grade	Name of unit / Details of activity	Utilized teaching materials, software, himepage	The aim for utilizing ICT devices / Actual experiences	Level of achievement	experiential	positive	Restrictions					Objective classification of ICT utilization
										spatial	repose	difficulty in moving	danger of infection	lying in bed / difficulty for long hours	
(1)Social Studies	1	A	5	Rice growing	Google Map Projector	Observe Shonai plains in Google map and understand large-scale rice growing directly, looking at the photograph from the sky. / Student B said “It’s surprising!” when found that the green lump was a large rice field, with a close-up from earth, then Japan, Yamagata prefecture, and finally Shonai plains.	A	A	A			✓			1-A 2 3-A **11-A**
	2	B	6	From village to nation	Kids Museum Tablet-type device with touch panel (iPad)	Research on the Internet the life of people in the *Jomon*, ancient period. Make real *Jomon* ware by paper clay and give designs with a rope. Let the student get interested in the life of people at that time. / The student researched how to make the ware with a tablet-type device with touch panel. After having understood a procedure, he started to make one with paper clay. He thought about how to put designs using the rope, watching the photograph of the earthenware. He turned it carefully to make rope design. He seemed glad and said, “I want to show this to my family.”	A	A	A		✓				1-A 3-A
	3	C	6	From village to nation	Kids Museum Tablet-type device with touch panel (Windows)	Research on the Internet the life of people in the *Jomon*, ancient period. Make real *Jomon* ware by paper clay and give designs with a rope. Let the student get interested in the life of people at that time. / The student researched how to make *Jomon* ware with a computer. Using keyboard seemed easier than using touch panel. He thought about how to put designs using the rope, watching the document of the earthenware. He started the manufacture of the earthenware after researching more on the Internet. He looked satisfied with his performance.	A	A	A		✓				1-A 3-A
(2)Science	4	D	3	How do plants grow?	Science network	Observe growth of okra, a plant, together with water culture. The soil had been sterilized. Growth of okras stopped for lacking in the sunshine and malnutrition. / The student gave original names to them. He measured their height, the size of the leaves every day. He realized their growth, and told about it happily to his chief physician or nurses. After their growth had stopped, he kept observing their growth on the video.	A	A	A	✓	✓		✓	✓	3-A **11-A**
	5	A	5	Growth of plants	Science network	Observe germination and the growth of kidney beans. Observation was cancelled because mold grew on them. / The student really enjoyed observing them and looking forward to their germination. However, his family brought them home and took care instead because of mold. He kept observing their growth on the video.	A	A	A	✓	✓		✓		3-A **11-A**
	6	A	5	Observation of killifish	Science network	Confirm distinction between male and female of the killifish. Watch the birth from an egg. Because keeping killifish is not allowed, video is utilized instead. / The student watched the video with fascination about the birth from an egg or how to take care. Photographs were used to make a distinction between male and female.	A	B	A	✓	✓		✓		3-A **11-A**

	7	C	6	Changes when burnt	Science network	Learn changing the color of the limewater or how to use a gas-detecting tube. For using fire is prohibited, the student watches video about the combustion of the candle. / The student confirmed that foaming bathing powder produces carbon dioxide when dissolved in water, and that gaseous product, collected by a method called water substitute, changes limewater white. In an experiment with the gas gas-detecting tube, the student read the textbook and instruction manual carefully, and worked on the experiment positively. Also he could find a document more detailed than the content of textbook on the Internet when learning about the ingredient and density of air.	A	B	A	✓	✓				3-A **11-A**
	8	D	7	Small creatures in freshwater	microscope with LCD monitor ready-made prepared slides	Observe with LCD monitor, not looking into the microscope column, lying in the bedside. Also learn how to operate a microscope. For the prevention of infections, ready-made prepared slides are used. / The student was not able to work because it was right after an operation. He set a prepared slide by himself and observed microbes. He looked surprised when he found that small objects on the prepared slide were real creatures after magnified.	A	A	B			✓		✓		2 3-A 6
	9	D	7	Structure of plants	Science network	Observe with 3D images about transportation of the nourishment, for it is prohibited to carry on plants. Learn how water, oxygen, carbon dioxide, and chloroplast moves in conducting tube or sieve tube of a plant. / The student observed a 3D image of a plant whose stem was divided vertically and section was shown. He operated that object with a mouse, then turned or rotated it. He also observed movement of water, oxygen or carbon dioxide. He moved their image on the screen by himself, saying “I see it.”	A	A	A	✓		✓				3-A **11-A**
	10	E	7	Structure of plants	Science network Wireless laser mouse	Observe with 3D images about transportation of nourishment, lying in bed. Learn how nourishment go along conducting vessel or sieve tube. Use wireless laser mouse, which is easier to handle. / Computer screen was rotated by 90 degrees, so it was easier for the student to watch the screen and operate the mouse. He used it by his left hand, since he couldn’t use his right hand by intravenous feeding. At first he didn’t handle well, but gradually he became accustomed to operating it. Finally, he was able to open the file of all the images, and observed them eagerly.	A	A	A		✓	✓	✓	✓	✓	3-A **11-A**
	11	B	8	Chemical reactions	Equipment for the experiment Science network	Prepare for the experiment about how to gather gases, lying in bed. Use real equipment for the experiment to understand its procedure. Watch video and learn how gases from chemical reaction are gathered. / The student prepared equipment for the experiment eagerly, looking at a figure in textbook. He breathed directly into water for downward displacement. He was little embarrassed, and breathed into a test tube. He looked glad to see that water in a test tube replaced his breath.	A	A	A	✓		✓		✓		3-A **11-A**
(3)Life Environmental Studies	12	F	1	Let's look for autumn.	Teaching materials on the Web "Autumn Plants and Trees" Computer with touch panels (Windows)	Look for the autumn trees and plants. / The student showed much interest even before computer is ready. He intended to look for as many autumn trees and plants as possible. It took time until images were displayed under the influence of transmission rate, but he didn’t care about it and enjoyed looking for them. Also he found other information about plays or cooking with autumn plants. He kept looking for trees and plants for more than 30 minutes, and found everything in this teaching material.	B	A	A		✓		✓			**11-A**
	13	G	1	Let's look for autumn.	Teaching materials on the Web "Autumn Plants and Trees" Computer	Look for the autumn trees and plants. / The student showed interest on computer. However, he showed little interest looking for autumn trees and plants. He touched panels several times, but not all. Even when the scene had changed, it didn’t attract him very much. This activity finished about 10 minutes. In the next class, he tried to make spins with acorn. At first, he didn’t show much interest as well. However, after he	C	C	C		✓		✓			**11-A**

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td>with touch panels (Windows)</td><td>started making them, he gradually became interested. After all, he was able to enjoy this activity.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">(4)Activities to Promote Independence</td><td>14</td><td>H</td><td>8</td><td>International communications</td><td>Video-chatting (Skype)</td><td>Talk with foreign people on Skype as a part of education for international understanding and foreign language activity. / The student talked with foreign people working at JICA, Japan International Cooperation Agency, on Skype. As a prior learning, he thought about how he introduces himself in English, or tried to understand how they live in their home countries. At first he didn't feel like talking with them, but he said it was a good opportunity to communicate with people living in foreign countries.</td><td>A</td><td>A</td><td>A</td><td></td><td></td><td></td><td>✓</td><td></td><td></td><td>11-A</td></tr>
<tr><td>15</td><td>I</td><td>7</td><td>Communications</td><td>Video-chatting (Skype)</td><td>Encourage communication and emotional stability. / The student in a clean room talked with the teachers on Skype, and talked about how they spend there or his physical condition. One of the teachers appeared with wig and sunglasses, and the student seemed enjoying. Also he talked with foreign people visiting a tourist spot close there.</td><td>A</td><td>A</td><td>A</td><td></td><td>✓</td><td>✓</td><td>✓</td><td></td><td>✓</td><td>11-A</td></tr>
<tr><td>16</td><td>J</td><td>5</td><td>Let's play together!

Who am I?</td><td>Software for presentation (Keynote)
Tablet-type device with touch panel (iPad),</td><td>Experience relationships and communication with people.. When the student touches the screen of the tablet computer, his mother or teacher appear with their voice. / When the student touched its screen, his mother or teacher appears with his face hidden by his hands. Then it became close-up, saying "Who am I?" He strongly reacted to the voice of one teacher of the three. When he heard someone say something, he tried to find out what was happening on the computer. After he got accustomed, he started to relax and tried to react to everything he saw.</td><td>A</td><td>A</td><td>A</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td>5-A
11-A</td></tr>
<tr><td>(5)Life-Unit Learning</td><td>17</td><td>K</td><td>1</td><td>Card matching game</td><td>iPad application (Mr. Shape's Touch Card)

Original hand-made cards</td><td>Understand the rules and enjoy learning with teachers. Find the same figure in playing. / The student played card matching game in iPad. She concentrated on the game. When she did the same activity with the original cards made by himself, he talked to the teacher everytime he did something; such as when he couldn't decide, his guessing was not correct, or he got the right guessing. He often expressed his pleasant feeling. Time sampling method was used.
<table>
<tr><td></td><td>iPad
(Mr. Shape's Touch Card)</td><td>Card matching game with original hand-made cards</td></tr>
<tr><td>Operation time (sec.)</td><td>1st trial:18 pairs in 84 sec.
2nd trial:21 pairs in 68 sec.
3rd trial:13 pairs in 48 sec.
Total: 52 pairs in 200 sec.</td><td>1st trial:18 pairs in 470 sec.
(11 pairs of student and 7 pairs of teacher)</td></tr>
<tr><td>Actions and expressions
Active
Very active</td><td>
13 times (3.9 time / 60 sec.)
1 time (0.3 time / 60 sec.)</td><td>
23 times (2.9 time / 60 sec.)
10 times (1.3 time / 60 sec.)</td></tr>
<tr><td>Verbal communication</td><td>3 times</td><td>23 times</td></tr>
</table></td><td>B</td><td>A</td><td>A</td><td></td><td>✓</td><td></td><td>✓</td><td></td><td></td><td>5-A
11-A
11-B</td></tr>
</table>

6 Obtained results and remarks

6.1 In each subject

(1) In Social Studies class, using geographical maps was considered to be efficient. Even in their hospital rooms, it was easier for students to comprehend geographical characteristics of the areas because ICT devices can enlarge the images when necessary. Also they could recognize that the pictures on their textbook is one of them taken somewhere in Japan, or feel passage of time comparing to the past and present of a certain area. ICT devices make the class more adaptable because of their capabilities.

(2) In Science class, using ICT devices provided the students with virtual experiences. They participated to the lesson eagerly by clicking or dragging the objects on the screen. They looked very interested in the objects moving or happening chemical reactions. However, they became passive when they keep watching the screen of the computer. Not just watching, using both strengths in laboratory instruments and ICT devices would furnish the students with more realistic experiences.

(3) In Life Environmental Studies, the two students showed contrasting reactions on ICT devices. One was very curious for the fact that the chirping of insects differs from their species, while the other showed little interests. That’s probably because he wanted to go out to look for the real ones.

(4) In Activities to Promote Independence, students enjoyed real-time video chatting with mobile data communication network. Using Skype, they can communicate with people in a distant place. They communicated with their friends, teachers, or foreigners they had never seen before. In a clean room, where even their family is not allowed to enter, they could use Skype to communicate with each other. This should be quite close to actual experiences, or an actual experience to some extent. ICT devices were helpful also for the students with severe multiple disabilities. They showed great interest on the screen when they found their teachers or family members. When they touched the screen, some changes occurred, like hearing something or changing the images on the screen, which led them to expect someone to appear or something to happen. Consequently, they could participate to this activity on their own initiative.

(5) In Life-Unit Learning, In card matching game, the amount of learning content increases with ICT devices, compared with using actual cards. However, the student becomes more active and tries to communicate more when actual cards are used. This means the student becomes positive and enjoys learning with actual object. So we should make much account of real experiences with actual object. When utilizing ICT devices, we should consider that communication between students and teachers is still important.

6.2 Characteristics on the purpose in utilizing ICT devices

ICT devices are utilized frequently as explanatory materials of teachers and substitute for actual experiences (Figure 1, the classification table of utilizing ICT devices). They seem to be used for reduction of time, and that shortened time is considered to be devoted to experiments or investigative learning. However, students tend to listen passively to what the teachers explain, so the content of learning can't become established easily. If time allows, repeating should be done after the lesson.

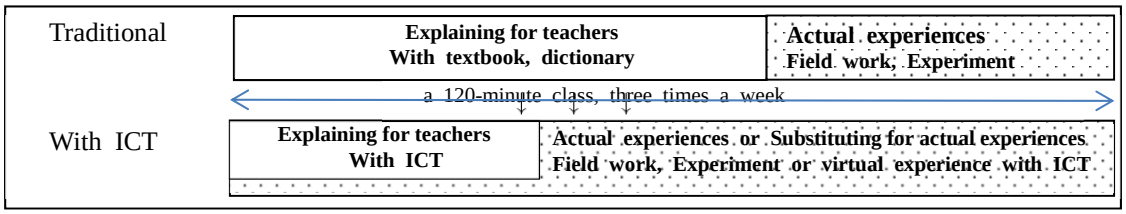

Figure 3 Substituting ICT for actual experiences

6.3 Relation diagram of classification of restriction and utilizing ICT devices

According to practical experiences, we can classify restrictions in teaching children's hospital into roughly three elements; A. temporal restriction, B. physical restriction, C. restriction of students' own. In addition, we found that utilizing ICT devices is effective for overcoming or relieving these restrictions.(Figure4)

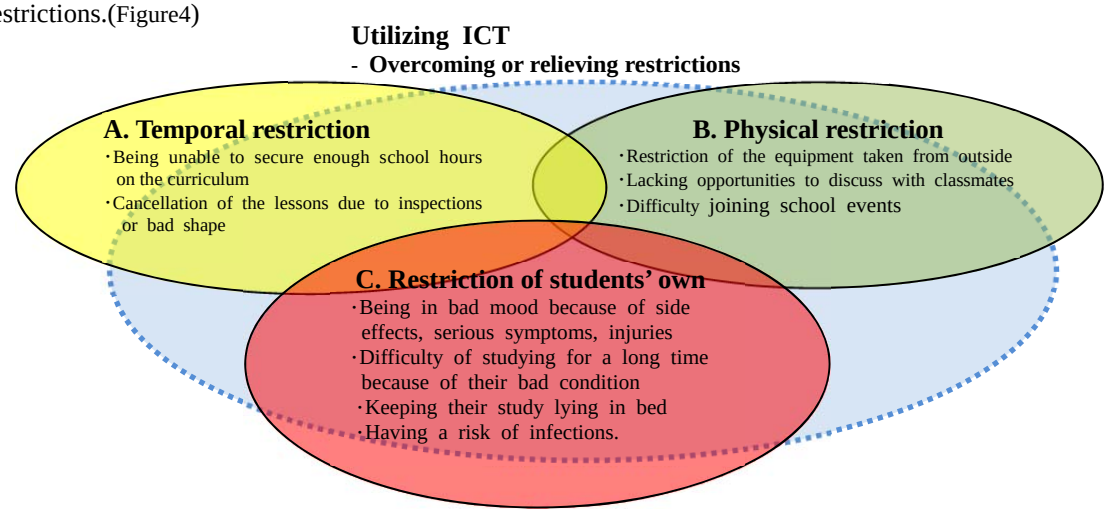

Figure 4 Restrictions in teaching in hospital

7 Conclusion and future issues

In this study, we set up a hypothesis that ICT devices can provide experiences quite close to reality for

students in hospital. They have many restrictions to learn there, but we presumed that students would play an active role in learning with ICT devices. Then we carried out a number of learning activities and methods to supplement their real experiences. As a result, ICT devices alleviated restrictions in learning in the subject of Science, Social Studies, Life Environmental Studies, Activities to Promote Independence, and Life-Unit Studies. With ICT devices, they experienced many learning activities enthusiastically However, ICT is not omnipotent; we can't do everything with ICT devices. The more efficient learning environment becomes with ICT, the less communicative the class becomes. Also, students usually get tired of learning with ICT devices after a while because of their monotonousness.

The thing we should remember is that real experiences are important for students in hospital. Experiences with ICT can be one of supplements of real experiences. But it is from these real experiences that students learn characters or special features that words can't convey, like seeing or touching real things. These experiences would be a guide to think about the things deeply, and also they can change the way of thinking.

If ICT devices should be one and only means under many restrictions, we must depend on them. However, if possible, it is much effective for students to learn things with real experiences. It is true that ICT seems of use for students in hospital. However, practical experience must be emphasized as well to form the basic concept of the things. ICT should be one of the supplements when teaching in hospital

References

[1] 全国特別支援学校病弱教育校長会・(独)国立特別支援教育総合研究所,"病気の児童生徒への特別支援教育病気の子どもの理解のために",Mar.2008.
[2] Guidelines for the Course of Study2003, 2008, ,MEXT,Japan
[3] National Curriculum Guideline for Special Support Elementary and Junior High School. 2009. MEXT,Japan
[4] Kengo Nishimaki,"About the practical use of ICT that aimed at the substantiality of the education for children with health impairments",電子情報通信学会技術研究報告(ET2010-24～ET2010-40)pp.5-9
[5] Kuniyoshi Takigawa・Kengo Nishimaki,"A Study on the Development of Tools for Information Sharing among Teachers in Charge of the Children with Health Impairments− Production of a Support Booklet on Education for Children with Health Impairments by ICT Information and Communication Technology Utilization —",川崎医療福祉学会誌Vol.20 No.1,pp.147-157,2010
[6] Katsuhiro Kanamori・Iwao Kobayashi,"Experimental Use and Evaluation of an e-learning System Based on Mobile Videophone for Advancing Visiting Education (<Special Issue>Studies on Practical Use of e-Learning)",日本教育工学会論文誌29(3),pp379-386,2005
[7] Takeshi Hasegawa・Toru Fukumoto,"A Practice about Science Experiment Learning at Lesson in Hospital : focused on Meaningful Reception Learning",電子情報通信学会技術研究報告(ET2010-24～ET2010-40)pp.1-4
[8] Takeshi Hasegawa,"病院訪問教育における実体験を補う学習指導について-ICTの活用を通して-",愛知県総合教育センター平成22年度夏期研修研究報告書(2),pp.476-485,Mar.2011.
[9] Takeshi Hasegawa・Toru Fukumoto・Makoto Hasegawa, "病院訪問教育における実体験を補う学習指導について-ICTの活用を通して-",第52回全国病弱虚弱教育研究連盟研究協議会 和歌山大会 研究発表資料集,pp.1-12,Nov.2011
[10] Hisao Sato,"愛知県の病弱教育のシステムの変遷と、今後の課題-訪問教育の変遷を通して-",愛知県総合教育センター平成14年度夏期研修研究報告書,pp.363-370,Mar.2003.
[11] Toshiyuki Mizuno,"病院訪問教育での理科の授業",訪問教育研究,第22集,pp.31-33, Dec.2009.
[12] 特殊教育総合研究調査協力者会議, "特殊教育の基本的な施策のあり方について（報告）", Mar.1969.
[13]病気療養児の教育に関する調査研究協力者会議,"病気療養児の教育について（審議のまとめ）", Dec.1994.

Acknowledgments

My deepest appreciation goes to ex-principal Mr. Michinori Matsui whose enormous support and insightful comments were invaluable during the course of my study. I would also like to thank principal Mr. Shoji Ogoda, Mr. Shuji Mizuno of Aichi Prefectural Education Center, Dr. Kengo Nishimaki and Dr. Kuniyoshi Takigawa of The National Institute of Special Needs education, and the teachers of Obu Special Support School whose comments made enormous contribution to my work. Finally, I gratefully appreciate the financial support of MEXT Japan. KAKENHI that made it possible to complete my thesis.

This work was supported by MEXT KAKENHI 24501237 , JSPS KAKENHI 24910010.