

The Effects of Utilizing a Videoconferencing System for International Discussions on Global Issues at a Japanese High School

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Living in the Information Age, schools and teachers are expected to utilize new information technology in education to make teaching more effective. In Japan, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has been strongly implementing policies to promote information education (IE) in schools since 1988. According to a survey in 2005 (Japan MEXT, 2005), 100% of high schools in Japan at present have computers and the Internet connections. However, videoconferencing systems have only been introduced only in a small number of schools. This paper is the result of a pilot research to see the effects of using a videoconferencing system in a Japanese high school. The purpose of the research was to clarify the effects of introducing videoconferencing system in a Japanese high school and of utilizing it for conferences with other schools abroad on the studies of global issues. The target students were in the 12th Grade in the year 2006. The counterpart school was an Australian high school in Sydney and the conferences were held in English. International discussions on global warming were conducted between the Japanese and Australian students. Affective competence and cognitive competence were measured using questionnaires and worksheets given to students both before and after the videoconferences. The results showed that both cognitive and affective competences rose after each videoconference. Not only the students who actively participated in the conference but also those who were in the audience showed positive effects. In the field of international cooperation on global issues, especially, the effects were large. These results suggest that in order to teach global issues in which international effort and cooperation are needed, direct contacts with foreign students are effective in increasing student cognitive and affective competences. On the other hand, as English was the main communication tool in the conferences, Japanese students faced a certain difficulty in communication. Also, teachers, especially English teachers, were required to make great efforts to assist students in preparing for the conferences. The effectiveness of an international videoconference depends largely on students' English skills and teachers' efforts.

Keywords : videoconferencing system, international discussion, global issues, Japanese high school

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Introduction

Living in the Information Age, schools and teachers are expected to utilize new information technology in education and make it effective for better teaching.

In Japan, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has been strongly implementing policies to progress information education (IE) in schools since 1988. According to a survey in 2005 (Japan MEXT, 2005), 100% of high schools (upper secondary schools) have computers and Internet connections. However, videoconferencing systems have only been introduced in a small number of schools, even though they have already been introduced into many private companies as they become more and more global.

This paper is the results of a pilot research to see the effects of using a videoconferencing system in a Japanese high school. There are many possibilities in utilizing a videoconferencing system at school. Firstly, it may make it easier to utilize outside resources for studying. Schools wouldn't have to send students outside or invite lecturers. Students can also enjoy face-to-face communications through the system. Secondly, it may give students opportunities to have casual communication with students in other schools. Thirdly, it may give students more opportunities to communicate with foreign teachers and students.

In studying global issues, such as peace or environmental problems, interesting contents can be taught utilizing a videoconferencing system, because international communication may facilitate students to feel more of a familiarity with these topics and to understand these problems from a different point of view.

Background of the Research

The United Nations has emphasized the importance of environmental education in several international papers, including Agenda 21 (UN Conference on Environment

and Development, 1992), adopted in Rio de Janeiro in 1992, and “Education for Sustainable Development” (UNESCO, 2005). This is because global environmental problems are caused by individuals in many countries, affect people of all countries in the world and should be solved by changing the values and attitudes of everyone.

In the “Courses of Study for High Schools” (1999) in Japan, global issues are expected to be taught mainly in geography classes. In its content, global environmental problems such as climate changes, the ozone holes and acid rain are included.

Although global environmental problems should be solved globally, in teaching global environmental problems in Japan many teachers have been emphasizing only the most serious problems and having been teaching that individual daily actions such as reducing garbage, reusing and recycling (the 3Rs) can solve the problems. This can be good for primary school students, but seems to be too easy a topic for high school students. It does not make students think seriously about the complicated problems. Students may misunderstand that those are the problems the government or international organizations should settle, and that taking simple actions like the 3Rs can easily solve the problems. Some of the students may start taking action, but others may just memorize them as knowledge. In contributing to the solution of global environmental problems, students are required to have global knowledge and views, an insight into the complicated problem, a respect of various values and the skills to find better solutions through discussions and negotiations. Izumi (2005) emphasizes the importance of introducing the process of cooperative decision-making in teaching in order to develop students as active participants in society.

A videoconferencing system is expected to be one of the tools for developing students’ ways of thinking, for improving their insights and understandings of various values, and for helping them to participate in the decision-making by giving them an opportunity to discuss global issues with foreign students and to make decisions by themselves.

Purpose of the Research

The purpose of the research was to clarify the effects of introducing a videoconferencing system in a Japanese high school and of using it for international conferences with schools abroad on the studies of global issues. Teaching materials were developed to see its effectiveness. The effects were evaluated both in the affective domain, such as students' interests and concerns, and in the cognitive domain, such as students' thinking and inquiry skills.

Method of the Research

The researchers developed a unit of study on global environmental problems. It was especially concerned with global warming, particularly whether the Japanese government should introduce daylight savings time or not. After giving lectures on the basic knowledge at a Japanese high school, students were required to make a debate on whether or not it should be introduced in Japan. The debate was done in English and Australian students listened to it through the videoconferencing system. After the debate, students had a question and answer time. This was effective because Australian students live under the daylight savings time system.

The effects on the Japanese students were measured by questionnaires and worksheets given before and after the discussions on global issues with foreign students.

The students who participated in the international conferences were students in the international course at Akifuchu High School in Hiroshima. As they are international course students, the school emphasizes the need for English education and international understanding more than other courses. They started using a videoconferencing system when they were in the 11th Grade, and the experiment was implemented when they were in the 12th Grade. The number of students was 73, but

the number that responded to the three questionnaires and submitted the three worksheets was only 33.

Process of the Research

Preliminary Experiment about global peace

Before the unit on global environmental problems, the researchers developed and tried another unit on global peace, focusing on the war in Iraq, when students were in the 11th Grade.

The process was as follows:

January 2006 : Selection of three students to write a speech script and translate it into English

17th February 2006: Pre-conference and preparation

Trial connection of the videoconferencing system [40mn.]

Lecture on basic knowledge of terrorism, the war in Iraq and the Japanese policy on peace based on Article Nine of the Constitution of Japan (abandonment of war) [30mn.]

Preparation of questions to be given to Australian students [10mn.]

24th February 2006: Videoconference [13:20-15:00]

1) Opinions given by three Japanese students [20mn.]

2) Answers by four Australian students to the opinions given by the Japanese students [20mn.]

3) Opinion exchange (questions and answers) about peace [30mn.]

The preparation in January was done only for the three students who would be the speakers. They prepared their speeches with the help of native assistant English

teachers. The pre-conference and preparation on the 17th February was for all the 11th Grade students. This was to make students accustomed to the videoconferencing system and give them basic knowledge on the issue.

In general, the opinion exchange was quite successful, especially in the affective domain. One of the Japanese students made a striking speech about her American boyfriend who had been sent to Iraq. As Australia also sent some soldiers to Iraq, many Australian students were deeply moved and expressed their opinions that they should think of the grief of the people left behind.

The problem was the lack of English skills of the Japanese students. Many students on the floor showed difficulty in understanding the contents of the speeches by the Australian students. It was impressive that a considerable number of Japanese students tried to actively participate in the discussion by asking questions and trying to express their opinions, but some of them were very basic, such as “I think peace is important”. The Australian students, however, warmly accepted their ideas by applauding. It certainly helped raise students’ concerns and awareness about peace.

However, some of the students’ limited competence in English made it difficult to improve their cognitive skills. They all agreed that peace was important, but it was difficult to deepen their understanding by discussing how to stop the war and recover peace in the world.

Experiment about global environmental problems

The experiment about global environmental problems was conducted on September 2006.

The theme of the unit was global warming.

The topic of the unit was the introduction of daylight savings time in Japan.

The objectives of the unit were:

Affective domain: To actively participate in the discussion on global issues and to raise motivation on international contribution and international communication in

English

Cognitive domain: To be able to give one's own opinion on various facts, values and opinions, and to explain why one has that opinion

The topic was considered to be good because it was suitable in developing cognitive skills for students; in other words, the topic makes students think and have their own opinions. This is a tangible problem in students' lives. The problem was introduced to the Japanese students by giving them two opposite opinions – supporting the introduction and opposing it. The international conference with the Australian students was held in the form of a debate between the supporting team and the opposing team. This was decided because the preliminary experiment on peace was focused too much on emotional aspects. Also, the researchers allocated more time for preparing the Japanese students to acquire the basic knowledge and concepts necessary to make them think and decide.

Another reason why the researchers chose this topic is that constructive communication between Japanese and Australian students could be expected. The introduction of daylight savings time has been discussed by the Japanese government since the 1990s, but it was not so familiar with Japanese students. On the other hand, Australian students have been living with daylight savings time since they were born. Because of such a gap between them, more fruitful communication was considered possible.

Most of the students were 12th Grade who participated in the preliminary experiment when they were in 11th Grade. However, since many students of 12th Grade were busy preparing for their entrance examinations, the researchers thought it essential to have some students of 11th Grade experience a videoconference in preparation for the following year, so a few students of 11th Grade participated in the conference as debaters.

The process was as follows:

August 2006 : Selection of nine students as debaters and the chairperson for the conference
Preparation for the debate and translation work by

selected students

Homework during the summer vacation on global warming by all students

8th September 2006: By Prof. Nagata, the first lecture on a basic knowledge and the second lecture for the supporting side

Preparation for the questions to be given to Australian students

[Total 90mn.]

15th September 2006: Trial connection of the videoconferencing system [40mn.]

By Prof. Hirakawa, the third lecture for the opposing side [40mn.]

22nd September 2006: The videoconference [13:20-15:00]

- 1) A debate about the introduction of daylight savings time between the supporting team and the opposing team by the Japanese students [30mn.]
- 2) Questions and answers between the Japanese and Australian students
- 3) The final judgment by the Japanese students

The lecture by Prof. Nagata on September 8 touched upon two major parts: the first part was intended to give students a basic knowledge of global warming, and the second part was intended to introduce supporting opinions for introducing daylight savings time in Japan. In the preparation process, Prof. Nagata, Prof. Hirakawa and the teachers of Akifuchu High School used mainly Japan Ministry of Environment (1997, 2005), Kiko Nettowaku (2002), Lonborg (2001) and Matsubashi (2002) as sources of information.

Preliminary studies by lecture

The contents of the first lecture by Prof. Nagata about a basic knowledge of global warming were as follows:

- a) To introduce various global environmental problems such as deforestation, desertification, air/water pollution, destruction of the ozone layer, acid rain etc. by using a map
- b) To make students aware of global warming and its characteristics: this is a long-term problem and affects all parts of the world, including Japan and Australia
- c) To make students recognize that the global temperature has risen by about 0.6°C in the last 100 years by showing a graph
- d) To explain the various effects of global warming such as the rise of the sea level, change in eco-systems, food production, floods and droughts, etc
- e) To explain the scientific mechanism of global warming: how the greenhouse effect is caused by CO²
- f) To make students think about which countries emit more CO² by showing statistical materials: Japan emits more than Australia, but if we see the emissions per capita, each Australian emits more than each Japanese person
- g) To make students think about how we can reduce emissions or remove CO² from the atmosphere
- h) To make students aware of the “Last Chance” story in the textbook and think about sustainability
- i) To introduce the Kyoto Protocol as a human effort to reduce CO² emissions

The contents of the second lecture by Prof. Nagata about supporting the introduction of daylight savings time were as follows:

- a) To make students recognize the framework of the Kyoto Protocol
- b) To make students think about the significance and problems of the Kyoto Protocol
- c) To show that CO² emissions in Japan have increased by 8%, though they should have been reduced by 6%
- d) To make students think about how we can reduce CO² emissions in Japan
- e) To introduce the concept of daylight savings time

- f) To explain that it is good to make effective use of the evening, that it has been introduced in many developed countries and that it was formerly introduced in Japan and is planning to be introduced soon
- g) To explain how much CO² emissions can be reduced by introducing daylight savings time
- h) To make students write whether they agree or disagree with the introduction of daylight savings time on a worksheet, together with the reason
- i) To make students think about what will happen in their lives if daylight savings time is introduced
- j) To make students write the questions they want to ask Australian students who are practicing daylight savings time on the worksheet

The contents of the third lecture by Prof. Hirakawa about opposing the introduction were as follows:

- a) To make students recognize that even if the Kyoto Protocol is fully respected, we cannot stop global warming but can only delay its effects by six years at the point of the year 2100 and make students aware of the concept of its “effectiveness”
- b) To make students recognize that by respecting the Kyoto Protocol, developed countries should spend 1.5% of their GNP every year and raise their awareness on the concept of “cost”
- c) To show that with only 1.5% of the GNP of developed countries, we can solve the problems of clean water supply, basic education and nutrition in developing countries, and save the lives of two million people every year, let students think about which should come first and which problems should be given “priority”
- d) To make students understand that the cost of introducing daylight savings time in Japan is estimated to be one hundred billion yen
- e) To explain to students about the other demerits (costs and risks) of daylight savings time, such as the increase of amnesia, risk of train and airplane accidents,

risk of financial problems, etc.

- f) To make students understand that the emissions that can be cut by daylight savings time are just 0.4% of all the emissions that Japan should cut, so the effectiveness is low
- g) To make students aware that there are much more effective ways of reducing CO² emissions
- h) To show students the time of sunrise and sunset in various places in Japan and make it clear that people in Hiroshima would have to wake up in darkness on many days, even during summer
- i) To show students the respective temperatures in the hottest months in Australia and Japan, and make them think about whether people can enjoy their evenings under daylight savings time
- j) To explain to students that Japan stopped using daylight savings time after three years, Korea also gave it up and not all provinces in Australia have adopted it
- k) To let students know that the cost of delaying global warming is much more than the cost of preventing disasters that will be caused by global warming and introduce the concept of “maximized use of limited funds” and make students think from this point of view
- a) In conclusion, to tell students the importance of thinking about cost-effectiveness, prioritizing and the maximized use of limited funds
- b) To make students write whether they agree or disagree with the introduction of daylight savings time on a worksheet, together with the reason

Videoconference with Australian students

The conference was held on September 22.

One student took the role of a chairperson and each team consisted of three students.

Both teams prepared PowerPoint presentations and asserted their opinions by showing figures, pictures and key words. It was helpful for both the Japanese and

Australian students. The Japanese students, especially those who were weak in English could follow the debate by watching the pictures and written explanations presented by the PowerPoint. Australian students could also understand the story better through the visual aids.

The procedure for the conference was as follows:

a) Exchange of greetings by the principals of both schools:

In August, the 11th Grade students of Akifuchu High School visited Bede-Polding College (High School in Sydney) and, at the end of September, Bede-Polding students were expected to visit Akifuchu High School, so this ceremony helped students to recall good memories and create expectations for the upcoming exchange.

b) A debate by the Japanese students between the supporting and the opposing team

Subject: Should the Japanese government introduce daylight savings time for global warming prevention?

These are some examples of assertions:

First assertions of the supporting team:

- Decreasing CO² emissions is urgent for stopping global warming.
- Japan should reduce 14% of its CO² emissions. Daylight savings time will contribute to this reduction.
- We can enjoy long evenings in summer.

First assertions of the opposing team:

- It requires a huge cost, though its contribution is just 0.4% of the emissions that Japan should reduce.
- We have many other ways of reducing CO² emissions with lower costs.
- It may cause amnesia and it is hard for human life.

Attacking assertion from the supporting team:

- Even though the direct effects are small, the introduction of daylight savings time can raise the awareness of people and force them to take actions, so the total of direct and indirect effects can be larger.

Attacking assertion from the opposing team

- We may be able to delay global warming but we cannot stop global warming. We should allocate funds for preventing disasters caused by global warming.
 - We also should allocate funds for children in developing countries who are actually suffering.
- a) Opinion exchange (questions and answers) between the Japanese and Australian students

The following are the examples of the questions:

Q (Australia): What crimes will introducing daylight savings time reduce?

A (Japan): Sexual assault and traffic accidents.

Q (Australia): What are better ways of reducing CO₂?

A (Japan): Using your own shopping bags and using public transportation.

Q (Australia): What other urgent things could you spend the 100 billion yen on?

A (Japan): Providing people with clean water, helping people with low levels of nutrition and children who cannot go to school.

Q (Australia): Do you think the government of Japan will allocate more funds to African children if they do not introduce daylight savings time?

A (Japan): The relationship is not so direct, but we should think of the priorities.

Q (Japan): Why do you have daylight savings time in Australia?

A (Australia): We do not know, maybe for energy savings.

Q (Japan): Do you have any difficulties adapting yourselves in summertime and wintertime?

A (Australia): Yes, at the beginning, but we become used to it after a few weeks.

Q (Japan): What do you do in the summer evenings?

A (Australia): We talk and play with friends. We like it because we can play longer with friends.

Q (Japanese): Isn't it hard to set watches, clocks, electronic devices and computers every six months?

A (Australian): Not so much. Computers are set automatically.

Q (Japan): Do all Australians like daylight savings time?

A (Australia 1): Yes, I like it, but maybe there are some Australians who do not like it.

A (Australia 2): I actually do not like it.

a) The final judgment by the Japanese students (Vote)

The Australian and Japanese students both voted for the opinion that convinced them.

Among 33 Japanese students, 11 supported the introduction and 22 opposed it.

b) Final speech

Both the Japanese and Australian students exchanged their speeches and this exchange was interesting and fruitful. They also promised to see each other again in Japan.

The Results of the Experiment

Effects in the Affective Domain

To see the changes before and after the experiment in the affective domain, the researchers used questionnaires.

The questionnaires consisted of ten questions, five of them were on communication in English and the other five of them on concerns about international contribution. These were:

I: In the area of communication in English

1. I like communication in English.
2. I will study vocabulary and sentence patterns in order to be able to speak English.
3. I have to know more about the world and about Japan in order to communicate with foreign people.

4. I have many things I want to ask foreign people.

5. I want to master English that is spontaneous and situational.

Students were required to answer these questions with (a) Yes, strongly, (b) Yes, (c) No, not so much and (d) No, not at all.

II: In the area of necessary skills for international contribution

To contribute to an international society, how important do you think the following skills are?

1. English skills

2. Interest, concern, knowledge and understanding towards history and cultures of foreign countries

3. Interest, concern, knowledge and understanding towards global issues such as conflict, poverty, the environment, etc.

4. Understanding and respect towards cultural differences

5. Understanding and respect towards global values such as peace, human rights, etc.

Students were required to answer these questions with (a) very important, (b) important, (c) not so important and (d) not important at all.

III : In the area of videoconference

The second and third questionnaires included two extra questions concerning their willingness to participate in videoconferences as follows:

1. By talking with foreign students in the videoconference, do you think you can deepen your thinking on the theme?

2. Do you want to talk on global issues again with foreign students in a videoconference?

Students were required to answer these questions with (a) Yes, strongly, (b) Yes, (c) No, not so much and (d) No, not at all.

The same questionnaires were given to the students on June 2005 (before they had experienced a videoconference), June 2006 (after they had experienced the first videoconference on peace in February) and September 2006 (immediately after they

Table 1. Results of the research on the areas of communication, international contribution and videoconference (33 students)

		Jun. 2005 (1st time)	Jun. 2006 (2nd time)	Sep. 2006 (3rd time)	Difference by t- test from 1 st to 2 nd time	Difference by t- test from 2 nd to 3 rd time	
I [area of communication in English]	1	Total	116	117	116	n.s.	n.s.
		Mean	3.5	3.5	3.5		
	2	Total	116	120	118	n.s.	n.s.
		Mean	3.5	3.6	3.6		
	3	Total	113	117	110	n.s.	n.s.
		Mean	3.4	3.5	3.3		
	4	Total	98	104	101	n.s.	n.s.
		Mean	3.0	3.2	3.1		
	5	Total	120	122	121	n.s.	n.s.
		Mean	3.6	3.7	3.7		
II [area of necessary skills for international contribution]	1	Total	118	124	115	n.s.	p<.01
		Mean	3.6	3.8	3.5		
	2	Total	110	123	112	p<.01	p<.05
		Mean	3.3	3.7	3.4		
	3	Total	109	122	115	p<.01	n.s.
		Mean	3.3	3.7	3.5		
	4	Total	118	124	119	n.s.	n.s.
		Mean	3.6	3.8	3.6		
	5	Total	116	118	115	n.s.	n.s.
		Mean	3.5	3.6	3.5		
III [area of videoconference]	1	Total	-	89	99	-	p<.05
		Mean	-	2.7	3.0		
	2	Total	-	99	99	-	n.s.
		Mean	-	3.0	3.0		

had experienced the second videoconference on daylight savings time). 33 students answered on all of these three occasions.

By giving four points to (a), three points to (b), two points to (c), and one point to (d), the researchers tried to find the changes in their answers by a paired sample t-test. We tried to investigate whether a significant difference exists.

Table 1 shows the results of the research on the areas of communication, international contribution and videoconference as far as the 33 students are concerned.

In the area of communication in English, there were no significant differences. This is because their willingness to use English was very strong from the beginning. As the students chose the international course of the school, their high motivation levels of communicating in English was to be expected.

In the area of international contribution, some significant differences were found in the three questions out of the five questions. There was a significant change in question 1. Students' awareness of the importance of English skills decreased from a mean score of 3.8 to 3.5 ($t(32)=3.464$, $p<.01$) after the second videoconference. For question 2, students' awareness of foreign history and culture rose after the first videoconference from a mean score of 3.3 to 3.7 ($t(32)=-2.737$, $p<.01$), and their awareness decreased to 3.4 ($t(32)=2.464$, $p<.05$) after the second videoconference. For question 3, students' awareness of global issues significantly rose after the first videoconference from a mean score of 3.3 to 3.7 ($t(32)=-2.871$, $p<.01$), but no significant change was seen after the second videoconference. There were no significant changes observed in questions 4 and 5 concerning understanding and respect towards cultural differences and international values respectively. In all, it can be concluded that the experience of the first videoconference affected students' concerns towards international contribution positively. They became more aware of the importance of understanding foreign history, culture and global issues. Maybe because it was their first experience and the preparation was not enough, some students might have been shocked at how little English they understood and the contents of the speech. However, in the second conference, students' English skills were improved and they understood the contents of the discussions better. With the

help of the figures and explanations in PowerPoint, they could understand the procedure better. The decrease in awareness about various factors of international contribution is the result of their greater confidence in understanding English.

In the area of the videoconference, there was a significant change in question 1. Students' willingness to participating in videoconferences rose from a mean score of 2.7 to 3.0 ($t(32)=-2.261, p<.05$) after the second videoconference. After the second conference, many students thought they could deepen their thinking on the theme. The students could understand the content more deeply and participate better in the second conference. No significant change was found in question 2.

As a whole, it can be concluded that the first videoconference raised students' awareness towards the necessity of improving their skills because it was quite difficult for them to be a part of the conference. On the other hand, the second conference was easier for them to understand, so students became less aware of the necessity of their skills, but felt that they could deepen their thinking.

The results suggest that international videoconferences can raise students' interests and concerns towards international contribution and dialogue.

Effects in the Cognitive Domain

Measuring the progress in the cognitive domain was tested during and after the second conference on daylight savings time.

The same worksheets were distributed to the students: the first time was on September 8 after the lecture of Prof. Nagata, the second time on September 15 after the lecture of Prof. Hirakawa and the third time on September 22 after the videoconference.

The worksheets asked students to mark either "agree" or "disagree" to the introduction of daylight savings time, and to explain why.

Table 2 shows the number of students according to their opinions among the 33 students. After the lecture for the supporting side by Prof. Nagata, 70% of students

Table 2. The number of students according to their opinions (33 students)

	8 th Sep.	15 th Sep.	22 nd Sep.
Agree	23(70%)	11(33%)	11(33%)
Disagree	10(30%)	22(67%)	22(67%)

agreed but, after the lecture for the opposing side by Prof. Hirakawa, the rate decreased to 33% because the students became aware of basic concepts of thinking and judgment such as “cost performance”, “effectiveness”, “priority” and “maximal allocation of limited resources”.

Table 3 shows the model of opinion change among the 33 students. The opinions of 18 students have changed during the unit of study. On September 15 and 22, there is no change at first glance by Table 2. The opinions of 6 students have changed before and after the videoconference. Three students changed from “disagree” to “agree” and other three students changed from “agree” to “disagree”. The students have become able to think in two different ways. In other words, some of the students who originally agreed changed their ideas, in the process of taking lectures and having international discussions, and they disagreed on the way or in the end. Some of the other students who disagreed at the beginning changed their thinking in the same way.

Table 3. The model of opinion change (33 students)

8 th Sep.	15 th Sep.	22 nd Sep.	Number
Agree	Agree	Agree	8
Agree	Agree	Disagree	2
Agree	Disagree	Agree	1
Agree	Disagree	Disagree	12
Disagree	Disagree	Disagree	7
Disagree	Disagree	Agree	2
Disagree	Agree	Disagree	1

Table 4. The transitions of reasoning levels (33 students)

	8th Sep.	15th Sep.	22nd Sep.
Level 1 (no reason)	2 (6%)	5(15%)	2 (6%)
Level 2 (simple reasons)	21(64%)	13(39%)	15(45%)
Level 3 (comprehensive reasons)	10(30%)	15(45%)	16(48%)

Table 4 shows the transitions of reasoning levels among the 33 students. Those who don't have a description of any reason are classified as "Level 1." Those who have a description of either the advantage or the disadvantage as to daylight savings time are classified as "Level 2." Those who have a comprehensive description considering the society based on either the advantage or the disadvantage of daylight savings time are classified as "Level 3."

On September 15, the level of thinking became dramatically higher. On September 22, the level of thinking became much higher. The students' ways of thinking improved and developed in the process of learning.

After the videoconference, many students referred to what they learned from the Australian situations, such as "In Australia, students do not recognize that daylight savings time is good for reducing CO₂ emissions" or "Some Australians should set their watches and clocks by themselves." This suggests that students could widen their views and deepen their thoughts through communication with the Australians. However, the number of students who agreed did not change after the videoconference.

The results suggest that well prepared international videoconferences can improve students' skills of thinking and reasoning.

Problems of Utilizing a Videoconferencing System

The success of an international videoconference in high schools depends primarily on the efforts of teachers, so the teamwork among teachers is the key to success. For

international videoconferences on global issues, especially, cooperation between English teachers and social studies teachers is crucial. Social studies teachers are required to prepare students to understand the contents of the issue in question and English teachers should prepare students to speak in English. English teachers should also negotiate with the counterpart school by email and on the phone. In the case of Akifuchu High School, it was the professors from the universities who prepared for the discussions on daylight savings time. However, for the future conferences, it will be necessary for the social studies teachers to be involved more for the preparation. It is also necessary that more than one or two teachers work in a team so that the workload allocated to one teacher responsible won't be too much.

The existence of positive students with good English skills is another aspect to be considered. In the case of Akifuchu High School, this problem was relatively easy to solve as it has an international course. This course attracts enthusiastic students from all over the prefecture. Still, students who were speakers, debaters and chairpersons sometimes found it difficult to find enough time for preparations because it required huge efforts for them to be well-prepared before the conference.

Utilizing a videoconferencing system within Japan is much easier because there is no problem with language. Also, utilizing it just for casual conversation such as a self-introduction is easy, even with foreign schools. The favorite question of the Japanese students is "Do you have a boyfriend?" Akifuchu High School utilizes its videoconferencing system more than 20 times a year for various purposes.

Akifuchu High School is expected that it performs various activities using the videoconferencing system considering the school's three-year-curriculum from 10th grade through 12th grade and develops the students' willingness and concerns step by step so that they will finally become able to participate in discussions and debates on significant topics.

On the other hand, the problems of technical support and maintenance are relatively small. Teachers can operate the system with just a little training. It is not difficult to request for technical support if there are enough funds for it.

Conclusion

The results of the questionnaires and worksheets suggest that an international videoconference can be one of the most effective tools for improving students' affective and cognitive competences, especially from the viewpoint of international contribution. In other words, by utilizing videoconferencing systems for international discussions on global issues, students raised their awareness to improve their English skills and to know more about the world, deepened their understanding and improved their thinking.

In utilizing videoconferencing systems, it is important to perform international conferences that include international discussions on global issues etc. for communication skills, affective and cognitive competences. Through international conferences, students can make better decisions towards solutions from global viewpoints.

In order to utilize videoconferencing systems continuously and effectively, it is necessary to establish supporting system as the whole school, so that no specific teachers will be required too much effort and to situate the school activities utilizing the videoconferencing system in the school curriculum.

It is expected that more experiments will be done to improve the ways of using videoconferencing systems in many schools.

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