

Opportunity for Development of Academic Culture in the Super Science High School Project

Kaori Wada

Abstract

This is a report which is a part of a Super Science High (hereafter, SSH) school project promoted by Japanese Ministry of Education (MEXT). One of their founded programs supports university teachers offering high school students a chance to learn academic skills with a Content-Based Learning (CBL) strategy in English for specific purposes in the fields of science and technology. Students can see and experience what research is through the medium of English for specific purposes. The experience of learning advanced levels of science through a foreign language increases student motivation, according to the student feedback following their various SSH activities. This report informs a SSH program in International Presentation Skills in English (hereafter, IPSE) during the first three years of Ministry founding.

Key terms: academic culture, Super Science High (SSH) school program, international presentation skills in English (IPSE), Content-Based Learning (CBL)

Academic Culture and the culture of Science and Technology

Academic culture used in this paper is focused on the science and technology (see *Figure 1*). Everyone has diverse ideas about how to define culture in general. Consequently, culture can be defined as everything we do in our daily life. How different we are, how we recognize people with distinctive features, such as gender, age, nationality, ethnicity, spoken language, religious beliefs and so on. What kind of values do a person has is also relevant to everyone who has his or her own characteristic features. Young learners, such as high school students in this report, have a chance to experience of science experiments guided by the science experts of their group research topics in their local community. Moreover, the learners can exchange opinions with people in the real academic research fields. If we developed an academic culture, we could share knowledge and ideas regardless of age difference. Throughout this process, the students communicate and exchange ideas with science specialists, and have practices of learning the procedure of science experiments. Learning the values, methods and communication styles and forms in the real research field, novices will be acculturating their academic skills as a part of academic culture by learning with experts. We hope students who had a chance to have this kind of experience; will be a scientist in future of our society. MEXT enforces Japanese high school students to develop their science and mathematics skills in current curriculum. If we have more young scientists in our society, we can recognize that the MEXT's original goal to promote this type of programs has been succeeded.

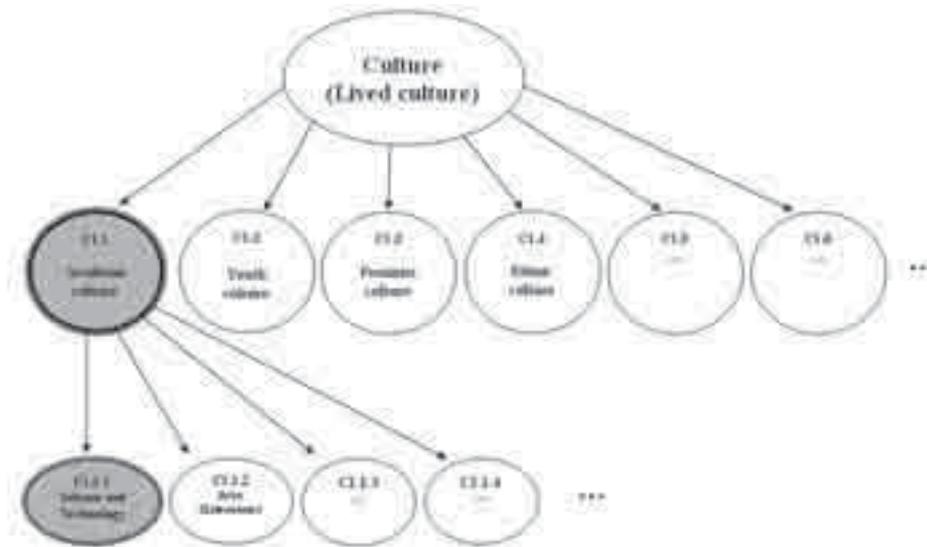


Figure 1. Academic Culture and culture of Science and Technology

In science and technology, the primary goal understands the world. Scientists continuously examine the world to find out facts. The fact might be a small piece of information or a brilliant new discovery in science and technology. As an illustration, in general scientific fields, we would usually have endless debates on whether we support evolution and creation theory. If we do not support either of these theories, then we can say that if scientists do not share their experiment results with one another, then there will be no progress in learning. According to Sikkema (2001), “*science does involve interaction...science – whether the scientist acknowledges it or not – enhances obedience to the cultural mandate by deepening our understanding of certain aspects of the world*”.

In any academic field, we build on what previous researchers have done. As has been noted, academic culture is a tool of communication and knowledge to access the advanced level of study fields between the different generations. It means novices of the research field can learn various skills from the experts. Therefore, on this occasion, it does not matter if senior high school students can participate in worldwide academic conferences and report their findings to experts. The young learners who have experienced academic culture are able to share their opinions and ideas with people who are experts in their fields from all over the world. In this current century, we have easy access to what people have done in any field of study by using the Internet. If we have a chance to develop an academic culture, like that described in the science and technology field, it will surely have an impact on our future.

Equally important, it is necessary to interact with people in what they have done and what they have found in real study fields. The researchers are basically required to speak and write English in either real conferences or in their research articles. In the process of approaching their goal, the young learners, such as high school students, will recognize a purpose for developing language skills, and concurrently, develop the scientific technology skills necessary for understanding the advanced level of their research fields. This learning process is still a part of academic culture because it is not concerned about just developing one of the academic skills. All the developmental skills including research methods, scientific methods, and language, one all inter-connected,

that is to say, they are integrated skills. Young learners of such high school students have more opportunities to meet people whom they can share and interact together with; they may be able to apply for overseas distance learning and academic journal after all. Furthermore, they could participate in conferences to present what they found in the worldwide conference. Accordingly, we will see future scientists emerging at an early age without waiting to enter the advanced educational stage, such as undergraduate or graduate programs.

The academic culture has different levels ranging from the basic to the advanced. That is to say, the bottom line of the level will be knowledge which is usually learnt in schools through school subjects such as science, mathematics, music and arts. Thus, the language skills for basic communication are still on the bottom line of the academic culture. Subsequently, learners acquire language skills in more specific research fields. Concurrently, it is necessary to develop presentation skills in the target language with training in scientific, language, and research method. Finally, young learners are able to increase to the highest level of academic culture in science and technology research fields in this way, and then eventually they can become young scientists. Even if they decide to change their major fields in the future, developing the skills of academic culture will help them to take the necessary steps to solve problems in other academic field. As we have seen, this is what academic culture is here.

Content-based learning (CBL)

In CBL strategy, students communicate through Second Language (hereafter, L2) in class. Students, who have CBL instruction in class, will acquire both language and culture at that same time by learning content in science and technology field. Using authentic topic and material in a CBL class supports student-center learning with positive atmospheres and motivation. L2 learners acquire language (L2) and culture (C2) of contents natural way. People who live in an L2 community use the L2 everyday in their daily lives. The English learners in Japan often said lack of this learning environment both inside and outside of classroom. However, acquiring L2 in this way, we can recognize the CBL environment is necessary for L2 learners to have a real and natural L2 environment even though they are staying in Japan. *in Content-based Second Language Learning*

In this report, the high school students have examined the scientific topics by working with experts of topics. At that time, students are able to learn not only the language skills, but also how to do the experiments in each stage of the research, how to summarize their research findings into Power Point slides, and how to present their whole research result in English as a presentation. This SSH has been instructing in the target language and culture in science and technology field in the classes of English and International matter. The other regular classes are giving instruction in Japanese, therefore students are able to have a chance to learn the content both languages, especially for their research project, students create materials, such as articles and Power Point slides both in English and Japanese (see Maizuru high school yearly report, 2007)

Super Science High School Project

According to the guidelines which were established by MEXT in the Science and Technology field of studies, the SSH schools deal with the first aim of Science Literacy Enhancement Initiative to stimulate young learners for their science and technology learning motivation and attitudes. The main theme of the SSH program is “*Enhancing Science Education and Promoting Public Understanding of Science and Technology*” (See the MEXT’s guideline document, 2004). How was the education system in Japan improved to help students achieve basic skills in science and mathematics, knowledge, and how doesn’t motivate them towards the science and technology field promoting the SSH program? Under this SSH promotion, young learners have the full benefit

time, we exchange more detailed information of the lesson concept by providing the materials in advance. The high school teachers, especially English teachers, give a preview lesson both in English and Japanese (when it is necessary) before the university team visit. Therefore, students are able to prepare at least the key terms of the lesson in advance. In addition, after the visit of the university team, the high school teachers review the lesson with students again. Afterwards, they focused on the assignment which relates to their research topics. Between the lessons, students and their teachers are trying to find the time to progress in order to reach their goal by the interval. Also, after the each lesson, the university team and high school English teacher sit together to review the lesson of the day, and to exchange information and ideas for the next lesson.

The university team visit is a part of the large scale of the SSH program actions (Maizuru high school website, 2005), so the main objective for visiting the high school was guiding how to develop learners IPSE. The overview schedule was introducing the basic presentation skills in the science and technology presentation, key terms and elements, note taking skills, brainstorming, techniques of creation between text to image, and image to text training, for instance (see, Appendix A). According to the schedule, students have a chance to experience research skills and develop presentation skills in English. At the end of the year, each group of students will have a presentation in English with a scientific research topic per group. There were 9 groups that have different research themes. For example, the themes included “Green Effect; the Green Curtain will bring us a better life” and “Mechanisms of the Hot springs”. Scientific experts or researchers including university professors support each group giving them a chance to learn the basic research skills throughout the program. Therefore, we can see this whole program is an integrated curriculum involving all of the school teachers and local experts of science, institutes lectures by front-line researchers and technologists (see, Figure 2). In their curriculum, students learn about the science and technology research fields both in English and Japanese. The student groups create their research articles in Japanese and English for presentation. They also have a chance to practice among the other SSH program high schools nation wide. This is designed by MEXT to give high schools the opportunity to apply the unique and effective way of teaching in the advanced levels of science and technology skills for students in future.

Background of this SSH program, Teachers and students

Participants are the first year students who major in science and mathematics under the ordinary senior high school curriculum in Japan. This year is the third year of their SSH program in a five-year program. The first year SSH targeted students are in the third year at this time, and they are focusing on preparation for the coming university entrance examination. Under the action of this IPSE, but the whole SSH curriculum still includes all grade students who belong to the science and mathematics major curriculum. Ordinary students also participate when the students present their research result in the gymnasium on performance day. Therefore, the university team focuses on the first year students when we visit the high school; however, MEXT originally designed this SSH project for all high school students both these who are mathematics and science majors and ordinary course students to be able to adapt the same program in future. That is why the SSH schools have to report all of their activity results in five years on what works and what does not work, what the problem was or how useful it is after having full support from their community universities and institutions experts support. The high school teachers have to work together to plan and set the goals and ways to reach their students and for themselves to have more opportunities to develop better teaching skills (see, Figure 2).

In this school year, there are 40 students. When the university professor has the mini-lectures, we are in the laboratory room with the computers which are connected to the Internet. Dr. Richard Berwick, who is a professor from Ritsumeikan Asia Pacific University, designs and creates the lesson materials and schedules with

high school teachers (see, Appendix A). All mini-lecture materials with the Power Point were created by him. The university Professor gives mini-lectures with the Power Point screen in front of them, and then students have assignments after the instruction. Sometimes, students are divided into four groups in different rooms to do activities with a TA. Each TA works with a small number of students. After working in small groups, the high school students gather together in the laboratory, and then report on what they have done in their small group at the end of the lesson with the university team. The whole visiting time is about two hours per visit.

Teachers in high school including all subject teachers are working together to meet the goal under the overall SSH program as a whole school project. Therefore, students have learned how to seek and find the solution in the other subject classes. What's more, its contents are relevant to develop research skills. This integrated action is obviously distinctive compared to other ordinary senior high schools' curriculums. This SSH program is applied to give chances to students to develop their research skills. In addition, the teachers have the opportunity to develop their teaching skills by communicating with university professors and experts of science and technology fields in their community. In this Maizuru high school case, they have enough supporters in the case of learners to do each step of the research procedures. For example, when they start to decide the research topic and field, most of the groups selected the topic from their local area study, such as hot springs mechanism issue in Oita, Japan and some environmental issue.

In fact, the high school students have had a chance to present their research project in the Chugoku, Shikoku and Kyushu chapters of SSH's presentation competition, and a nationwide SSH school competition this year. Including the second and third year students, they had an opportunity to exchange what they have done under the SSH program. Accordingly, their SSH promotion has succeeded from their students' actions.

Feedback from students and teachers

According to the student survey report, the high school teachers found that students who like science and mathematic subjects responded that the whole SSH program helped them to have more interest toward the scientific fields. However, students who have no interest in science fields are also enjoying the experiments and learning the skills of presentation procedures and research (refer to the Maizuru high school yearly report, 2007). The purpose of this SSH program was not to make students become fond of science and mathematics. Even if students will change their major to the other fields in future, they still have a chance to learn the basic research skills under this curriculum. As we have seen, it meets their original goal. Refer to the high school report booklet for the SSH program (see, Maizuru report, 2007), to see more details of feedback from students and teachers in the high school.

CALL support

Over the past two years of SSH program, this high school has been using an online course, Moodle (see Figure 3), to enhance their interaction more with outside supporters, in this case, basically our team of TAs and university lecturers. The format of this online course is organized based on topic. In addition, the visit of the university team has been about once a month this school year. Therefore, most of the materials which were used in the mini-lecture were available for all enrollment users to download from the online course. Teachers including TAs and students have access to the materials, such as Power Point files for the mini lectures and materials in class.



Figure 3. The view of the Moodle online course web site Retrieval date:

This online course has several functions such as forum, chat, and links for beginning users of this platform. The language is set at English only. When users communicate and interact on this online course, everyone has to use only English. It is designed for students to create and use English outside of the class. Moreover, the online course helps to record all of the schedules and materials in the case of IPSE action. Thus, students can review individually whenever they access from home or somewhere outside of school. All their accesses are recorded and monitored by teachers. Teachers can also see how users use this online course for 24 hours.

In the beginning, the instructor teaches how to use each function little by little in the laboratory. During that time, students have a chance to use each functions of Moodle in class. However, the university team visiting time is really limited, so high school teachers have to work with students at another time. Therefore, even though supporting the basic skills of how to do each function may be simple, in general, adapting to this kind of online platform is a burden for the teachers in high school, especially the English teacher who always supports the students, has more responsibility to cover everything which were other part of SSH actions. This is one of the problems when thinking about what is the best way to use sub materials for this SSH project. In short, it is not only the high school teacher who can not adapt the CALL materials in their teaching method at any levels but it also includes university lecturers.

At the same time, the high school teachers start teaching how to use the basic computer programs, such as Word, Excel, and Power Point program with content in class. Students have exercises between an English text to images or graphics by using Excel or Power Point programs (see Figure 4).



Figure 4. An example image from a lesson material of Dr. Richard Berwick (2007)¹

After having some exercises on what kinds of functions each program has, they will start working on their own research topic with their group members. Therefore, this whole project can not succeed without the high school teachers' support, especially English teachers, who took care of the preview and review lessons before the university team visit.

Figure 5 shows an example view of the 2nd lesson for the IPSE. There are several features. The 1st function was a link for the mini-lecture Power Point program for the brainstorming. The 2nd one is a supplemental material to make sure they can check out the basic rules for the brainstorming activity written in Japanese. The 3rd one is a Chat tool. All users can use the chat room to do exercises of brainstorming in class. Students have to type the word for the main topic at that time. From that activity after the mini lecture, they can see what brainstorming is. After that, they move in groups to different classes to brainstorm their research topic. The 5th lesson is homework information which all users can see after they click, and the "Your Group files" function which is required to submit their Word document for their brainstorming results in groups. The "Google image web site" is just a link. Users who click on it can directly go to the Google image website to search some images and more information for their brainstorming. They are instructed to do brainstorming activities not only with words, but also finding images or graphics for their research topic (Figure 5). The circled sectioned are the features that users click to do each function in Figure 5.



Figure 5. An example view of a lesson with Moodle features

So far, we have adapted the online platform to this IPSE instruction, however, again, the high school students and teachers are on tight schedules to complete all these SSH action research activities. Therefore, they are not free to make time to use many of these online materials in class. It was considered about what would be the effective way to use this type of online material in this action. We designed this for students to be able to interact and exchange information with overseas students. However, the set-up has not worked well. This is also a time-consuming problem for both high school and university teachers. Teaching assistants are also available to reply to student comments individually, however, if there is only a little access from high school students, it seems not to be used enough. Under the current condition, what would be the best way to use this website for this SSH program? A successful use of this online course will be having regular based partnership, especially promoting online interaction with overseas high school students or university students. It will be really good for the users to have real interaction about science topics. Actually, the students have had a chance to meet high school and university students in the United States when they went on a field trip to Yellow Stone National Park. We should use those connections with people who have had face to face communication once so that it will lead the students to use the online platform, and also lead them to create and use real English interaction throughout this online support.

Conclusion

As a team supporter of this SSH program for the past three years, I could see significant changes from the learners and school teachers. In addition, this promotion is moving on to the next stages at the halfway point by involving PTA, local community people and institutions which was designed by MEXT's original guideline. The local people around this high school are noticing what this high school has done so far in the past years after they visited to see their performance and open school events. Sometimes it is difficult to see clear results in a short period, however, the whole SSH program has moved on to the next stages. Afterwards, how much have the people who are involved in this program, such as students, high school teachers, parents, and all of the supporters in the community, improved the current condition year after year? As a result, we could see what the MEXT has designed for, and the benefit of using all their support returning to young learners. At this point, only the high schools which applied to SSH are struggling to meet the goals set in the process. In the future, this movement will spread out nationwide and then finally support this Japan's science and technology demand to survive in the current world condition.

Notes

1. Material from Berwick, R. (2005) for International Conference, "Language in a Changing World", Dec. 9 – 11, Language Center of the University of Athens

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Appendix A

(Yearly schedule for Super Science High School Program with Ritsumeikan Asia Pacific University, made by Dr. Richard Berwick)

Session	Date	Content	Micro Skills/method	Personnel
Unit 1 – Getting Started – Elements of Science and Technology Presentations, Keeping in Touch, 4/18/07 – 4/25/07				
1 OPENING SESSION	4/25	Overview of course What’s a presentation in sci/tech? What does a presentation look like? Moodle: What’s that?	<ul style="list-style-type: none"> • What does the year look like? • Three reasons why a good presentation will make you happy! • Key elements of a sci/tech presentation • Ways to keep in touch: Moodle for the masses 	Main speaker, Moodle Coordinator/ Interpreter, 4 TAs <i>Moodle workshop</i>
2	5/23	Selecting a topic and method Elements of the abstract (I) Moodle: How’s that?	<ul style="list-style-type: none"> • Brainstorming • Rendering text to graphics • Talking about graphics • More Moodle! 	Main speaker, Interpreter (floating among English-only TAs in labs), 4 TAs <i>Brainstorming Workshop</i>
Unit 2 – Preparing and Presenting, 5/19/07 – 7/25/07 and 10/10 – 11/21				
3	6/27	First things first: Research and the abstract	<ul style="list-style-type: none"> • Elements of the abstract • Research and presenting research • Planning Q and A • <i>Using observation worksheets (handouts)</i> 	4 TAs, Main Speaker, Interpreter <i>Q and A workshop</i>
4	7/19	Learning about other cultures (I)	TA presentations (2) w/ PowerPoint	TAs only; for whole school
Break for the Summer. Individual and group assignments to prepare for 10/27 panel presentations (incl. writing abstract for the group presentations)				
5 SPEC. PREP	10/17	Principles of self-presentation Poster/panel preparation and rehearsal (lab and classrooms)	<ul style="list-style-type: none"> • Attention getting • Eye contact • Voice control • Stance • Evaluation worksheets for posters and panels at Maizuru Students practice presentations for 10/27 Random Q and A, feedback	Main speaker, Interpreter (floating among English-only TAs), 4 TAs <i>Happyokai Workshop 1</i>
6 PRESEN- TATIONS	10/27	Poster and Panel Presentations -	INTER- HS COMPETITIONS (GYMNASIUM)	Main speaker, Interpreter/Moodle Coordinator

7 GUEST PRESENTATIONS	11/14	Guest speakers: Presentations in environmental sciences/medicine (lecture room, joint session)	Evaluating presentations (worksheets x criteria)	Main Speakers (2), Interpreter, <i>Q and A</i>
8. Classes to New Zealand in December				
9	12/19	Group Presentation and practice Qs & As	Evaluating presentations (worksheets x criteria)	Main speaker, Interpreter/Moodle Coordinator
10. CLOSING SESSION	1/23	Learning about other cultures (2), Practice Q and A about their country and culture	TA presentations (2) w/ PowerPoint Evaluating presentations (worksheets x criteria)	4 TAs, Main Speaker, Interpreter <i>Q and A workshop</i>
**Faculty and Staff Evaluation in January (poss. 1/20/08)				