SCIENCE AND TECHNOLOGY DELIVERY: SCIENCE EDUCATION ON THE MOVE

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Abstract

"Science and Technology Delivery" is an outreach program for school science classrooms. It is one of the practical trainings in an education program of science and technology communication in University of Hokkaido in Japan, which is called "Communicators in Science and Technology Education Program (CoSTEP)".

This paper argues that 'science delivery' is useful for the development of human resource in science and technology communication. I will discuss the benefits and issues of 'science delivery' in following steps.

1) I will show the development of 'science delivery' project.
2) Then, I will summarize the benefits and issues of 'science delivery' from the standpoints of the delivering side - CoSTEP students, and the delivered side - school education including pupils, parents, and teachers.
3) Finally, I will consider the advantages of 'science delivery' in our science and technology communicator education program.

Keywords: science and technology delivery, science education, science communication, PBL (Problem Based learning)

1. Introduction

"Science and Technology Delivery" (hereafter 'science delivery') is an outreach program by researchers and experts for primary and secondary school science classrooms. There are already of 'science delivery' is held in many schools in Japan. It is said that 'science delivery' can increase the students' curiosity [1], strength the connection between researchers and schools, provide learning opportunity for schoolteachers [2], and improve outreaching skills of experts and their understanding of science education [3]. This paper reports a 'science delivery' project in an education program of the development of science and technology communicators, which is called 'Communicators in Science and Technology Education Program (CoSTEP), in Hokkaido University, Japan. This project is the advanced practical training, followed by the basic lectures and practical lessons. Therefore, we are not arguing the benefit of 'science delivery', instead, we are examining the significance of 'science delivery' as the advanced practical training of the development of the human resource in science and technology communication.

This paper argues that 'science delivery' is useful practical training for the education program in science and technology communication. I will discuss the benefits and issues of 'science delivery' in following steps.

First, I will show the development of 'science delivery' project.

Second, I will summarize the benefits and issues of 'science delivery' from the standpoints of the delivering side - CoSTEP students, and the delivered side - school education including pupils, parents, and teachers.

Finally, I will consider the advantages of 'science delivery' in our science and technology communicator education program.

2. Development of Science and Technology Delivery

There were three steps in the development of science delivery project.

2.1 Consultation

First, we had a consultation with students. One student is PhD candidate (T) obtaining a master's degree in medical science. He has a teaching license and has been teaching science in a high school as a part-time teacher for three years. The other student (M) is working for the PR section of the university. She has a master's degree in engineering, but she does not have a teaching license. Then, we had discussed what they will be delivering. Both students said at first they want to deliver what they researched in the graduate school. However, students had to consider the specialty of 'science delivery' because it should be neither a normal science lecture by experts nor a normal science class by school teachers. Rather, we want them to take the position of science and technology communicator who can consider both fields of scientific research and school education.

2.2 Teaching skills

Second, students (T and M) were making their class plans. One of the teaching staffs of CoSTEP, an expert in science education, had taught how to teach science, which is almost equivalent with the training program for obtaining a teaching license for three months. After that, students have learnt to prepare for teaching, especially

'class plans'. After that, students were preparing the 'class plans' until the day before the date of 'science delivery'. Students and teaching staff kept discussing from time to time.

Especially, student M practiced her 'class plan' several times to acquire satisfactory practical skills that are almost equivalent to the teaching qualification.

2.3 Negotiation

Third, students looked for schools where they will have 'delivery'. Teaching staff introduced some cohort connection to students, but practically they negotiated with schools by themselves. It was harder to find schools than we had thought at the beginning because school teachers had already scheduled classes when we asked them to spare a class for 'delivery'. We should have asked them before the beginning of the academic year, which is April in Japan. In the end, both students found schools. Student M has got a class time in a public elementary school. Student T has got a class time in a public high school. In addition to finding schools, they also had negotiated with school teachers what to deliver.

3. Benefit and Problem

School&student	date	grade	Title
S Elementary School (Student M)	17 Feb. 2006 (60min.)	Sixth-grade (31 students)	Super-absorbent polymer in our live
N High School (Student H)	17 Mar. 2006 (50min.)	First-grade (40 students)	The life science ~ the lung~

3.1 The case of student M

Student M went to an elementary school and delivered a 60 minutes class. Her 'science delivery' was about the super-absorbent polymer. She showed how much water the polymer is absorbing. She also showed the disposable babies' nappy have the polymer inside. The class was successful and response from pupils was very positive both in class and in questionnaire. Teachers were very positive with our 'science delivery' and even ask us to do 'science delivery' again.

We also asked parents of pupils by sending questionnaire. Parents are interested in 'science delivery' and many replied that their children talked about the content in the 'science delivery' to them. Some parents are interested in the experiment too.

3.2 The case of student T

Student H went to a high school and delivered a 50 minutes class. The class was chemistry class, but most of them will study chemistry in the next year. Therefore, thinking the curriculum, H brought the lung of a pig as the main topic. He taught both biological and chemical aspects of the lung. A few of them get slightly sick when they saw the real lung. However, the students mostly had positive feedback in questionnaire.

3.3 Evaluation of Delivery in Schools

Both cases have following positive evaluations.

1 Based on questionnaire, students' interest in science increased.
2 Science delivery can be replaced by school science.
3 Teachers have positive response to science delivery. Their understanding of science communication was also increased.
4 Elementary school was asking for the next 'delivery'.

4. Self-evaluation by CoSTEP Students

We interviewed students after the first year of CoSTEP program.

4.1 Student M

M thought at first that 'science delivery' is just teaching a class of 30 pupils. But, after studying in CoSTEP and conducting 'science delivery', she realized it may influence the wider public. She realized it very much when 'science delivery' was reported in the local news. After reported, her colleagues in the university were talking to her and asking the tips of outreach program. She found that her 'science delivery' change not only pupils' attitude toward science, but also researchers' mind toward outreach activity and science communication.

Through the training practice, she said she learned that people who are conducting 'science delivery' need to understand the background of both scientific research and school science. As she has studied and worked for the research institution, she did not know the needs and opportunities in school education. She also found that communicating over the disciplines and fields needs a lot of negotiations and discussions, but it is very interesting. She wants to continue 'science delivery' or similar activities, which are bridging researchers and school education.

4.2 Student H

H has been teaching in a high school as a part-time teacher. He had wanted to improve science education from the view point of his experience in the medical research as a PhD student. However, he could not discuss with school teacher and colleagues in his laboratory. But, CoSTEP was very good opportunity to extend his idea. He said that he could provide a class by combing his knowledge in research and skills learned in CoSTEP. For him, 'science delivery' improved his skills as a teacher, and also stimulated his motivation towards research activity. He also wants to continue similar activity. For sustainable development, he made a group where teachers, researchers, and citizens can share information on science education and outreach activity. There are 25 people and they are planning some projects.

4.3 More support for science communication

Experience of both students implies that there is an interesting field between research and education. They seemed to enjoy communicating those two poles. However, we also found that there is still few support and opportunities for people who can practice such activities. Also, both students are very busy with their work and research, so it was somewhat difficult to spare time for preparing 'science deliver'. In a sense, they were lucky because their colleagues understand their activity. If they were busier and could not get understanding from colleagues, it was impossible to conduct 'science deliver'. We need to consider the circumstances of students when we teach practical science and technology communication skills.

5. Analysis

5.1 Science delivery as a school education

We mentioned this report does not argue the effectiveness of 'science delivery' for school education. However, 'science delivery' seemed to improved the pupils' awareness and motivation towards science, increased the awareness of science education by parents, stimulated the motivation of school teachers, elevated a researcher's motivation towards research, and connected between university and school.

Communication between researchers and school education would be win-win situation. We should be cautious that 'science delivery' is just one of the ways to increase communication between researchers and schoolteachers. We need to continue the collaboration and discussion between teachers and researchers.

5.2 Science delivery as an education program of science and technology communication

To conclude, 'science delivery' is useful for an education program of science and technology communication. Science delivery is especially useful for teaching practical skills. In CoSTEP, students can learn the basic knowledge and skills in lectures and workshops. But, conducting 'science delivery' is teaching students more than what we can provide in classrooms. Education program for science and technology should be taught in the method of 'PBL'.

If 'science delivery' is just teaching, we did not have to teach the basic knowledge and skills for communication. So, these science communicators can communicate between researchers, schoolteachers, pupils and pupil's family; therefore, citizens think to that science lied in our life.

6. Future Works

We think 'science delivery' is a system of science communication between research and education in future. Schoolteachers want to researchers' knowledge, and researchers want to schoolteachers' knowledge too. Our 'science delivery' project will be useful for all citizens including researchers, schoolteachers, pupils and pupil's family.

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