From top-down to bottom-up: a short history of science communication policy in Japan

Masataka Watanabe

Abstract

Japan's policy of "public understanding of science" (PUS) has shifted to "science communication" since 2003. That year, there were a number of simultaneous developments with regard to science communication. The key report that advocated for the promotion of science communication and a textbook on science communication were published then. The most important consequence was that the report triggered a policy change at the Ministry of Education, Culture, Sports, Science and Technology (MEXT). The following year, MEXT published the White Paper on Science and Technology 2004, the main theme of which was concerned with science communication. Although the shift may have begun as a somewhat top-down contrivance, it has subsequently sunk down firm roots throughout Japan. In 2011 the Japanese Association for Science Communication was founded. People's awareness of science communication was significantly changed by the Great East Japan Earthquake that occurred on March 11, 2011. Why was such a policy shift possible? How did such a cascade effect occur? This paper will discuss the reasons behind these phenomena.

Keywords

History of public communication of science

Introduction

Western science and technology were brought to Japan from the sixteenth century onward via Portugal and the Netherlands. Through the mid-nineteenth century, Japan was a closed country, permitting commerce only with the Dutch. This precedent was broken by the American naval expedition that came to Japan in 1853 from the east. But in one stroke, the country took steps toward opening its doors and the Tokugawa shogunate was overturned.

It was only after this that education in modern Western science and technology could formally be offered, though Japan had its own tradition of science and technology before then [Nagahama, 1994]. As a consequence, the Japanese people have interacted with modern science and technology for only about 150 years.

After taking steps to artificially introduce Western science and technology, Japan as a nation hastened along in the spirit of trying to catch up with Western science and technology and then surpass it. During that time, most Japanese people believed that science and technology would gradually advance if left in the hands of specialists. Japan would go on to win fame as a country of advanced science and technology.

Phase 1: promoting public understanding of science and technology

As part of its efforts to recast itself as a country of peace following World War II, Japan sought economic recovery centering on emerging science and technology. In 1958, the Japan Science and Technology Agency (founded in 1956) published its first *White Paper on Science and Technology*. In Chapter 3 one can find the following pronouncement: "In recent times, Japanese people have had many opportunities to build familiarity with science and technology. The more scientific and technological issues and successes are reported, the more people of all ages will place their dreams on science and technology. (. . .) If we are able to offer educational opportunities to encourage the sound growth of dreams and aspirations relating to science and technology, then various self-motivated activities that make use of science and technology will effectively develop in the near future."

The Council for Science and Technology was established in 1959 to advise the Prime Minister on science- and technology-related policies. In its first policy proposal in 1960, the council opined that, while it was vital for Japan to develop a talented workforce to drive its long-term pursuit of the sciences and technologies needed to grow the economy and improve lives, the Japanese people lacked basic knowledge of and education on these subjects. Moreover, there just wasn't the required political will and public sentiment to provide support for such activities. Therefore, the council said, the government must start by raising awareness of science and technology among the populace. It can be said that this policy marked the dawn of public administration aimed at boosting public understanding of science.

That same year, "National Science and Technology Week" was established. It is the week around April 18 each year, the day itself having previously been known as "Invention Day" since 1954. It might be one of the earliest attempts of its kind in the world, with even countries like the UK not starting a national science week until 1994 [Briggs, 2001]. That same year the Japanese government and industry together established the Japan Science Foundation to contribute to the improvement of science and technology by effectively conducting activities to deepen the general public's understanding of, and interest in, fundamental scientific knowledge and industrial technology. The foundation would later open a science museum in Tokyo and launch a local TV company in 1964. Known as Tokyo Channel 12 "Science TV," the channel was given its broadcast license on the condition that 60 percent of its air time was dedicated to science and technology educational programming. Initially, it met this requirement only in the technical sense; the "programs" were simply broadcasts of distance-learning classes offered by Kagaku Gijutsu Gakuen High School, a science and technology high school also established by the Japan Science Foundation. It was only three years after its launch that Tokyo Channel 12 finally began to air regular programs.

The 1960 polcy proposal by the Council for Science and Technology mentioned above also set long-range targets in various science and technology fields. These focused on achieving within ten years a general advance in living standards and proposed the necessary strategies for fostering capable human resources. These were presented as being for the sake of economic development. It also highlighted the need to promote public understanding of science on the grounds that "Public knowledge and literacy regarding science and technology are very poor and the political and public bases for the support of science and technology are very weak." Such a top-down policy was sustained during the 1960s and 1970s. The Japanese government continued to tout "the dream of science and technology" until the

1970s. In Japan, a national opinion survey of public attitudes toward science and technology — its main question being whether or not people have an interest in science news — has been conducted almost every five years since 1976. Although the significance of such a survey has been controversial [Durant, Evans and Thomas, 1989], we can recognize an interesting trend by analyzing differences among generations. From the results of the survey, it was shown that people in their 20s and 30s reported the highest levels of interest in science and technology in 1976, and this generation would maintain its interest in science and technology throughout the survey period [Watanabe and Imai, 2003]. This may be attributable to the "public understanding of science" policy carried out by the government during the 1960s and 1970s.

As the 1980s began, while people's lives had become richer to some degree, the negative aspects of cutting-edge science and technology had also become apparent and society on the whole had grown increasingly indifferent to science. The *White Paper on Science and Technology "Trajectory and Prospects on the Development of Science and Technology"* published in 1980, the year following the Three Mile Island accident in the US, contained a section titled "Requirements for Promoting Science and Technology." It claimed "Public understanding and cooperation are necessary for promoting science and technology." We should note that this usage of "understanding" references a viewpoint from the government which expects the public to agree with and accept its policies. The *White Paper on Science and Technology* in 1982 also continued the same tone that was ruled by archetypal phrases about the importance of science education. In a section titled "Promotional Action Plan to Gain *Public Acknowledgement* and Support for Science and Technology," [emphasis added] it claimed "We should carry out the proper evaluation at each step of research and development and increase public awareness so as to advance science and technology effectively and to raise creativity in science and technology. In particular, it is much more important to gain public acknowledgement and support by means of *enlightenment* to foster a scientific mindset and awareness among the younger generation" [emphasis added]. Thus, the government policy emphasized "enlightenment of the public" and promoted the construction of science museums and science centers across the nation.

At the national level, Japan convened the International Science and Technology Exposition in 1985 at the new science city Tsukuba. Since 1992, Youngsters' Science Festival events have been supported. These festivals collectively offer science shows, booth displays, and workshops under one roof. Drawing the engagement of many science volunteers, this series of events was at first held in only three cities. Local governments and various industries offered their support, and the festivals have spread to more than 100 cities around the country with some 420,000 people taking part. The *White Paper on Science and Technology "Young People and Science and Technology"* published in 1994 has a different tone. In Part 1, "Young People's Indifference to Science and Technology," it discussed this apathy and espoused "fostering an atmosphere for making science issues relevant to young people."

However, even these kinds of events that convey the pleasures of science to the youth would appear to be insufficient for instilling recognition of the importance of knowing how to make the most out of science in daily life. Evidence of this comes from the Programme for International Student Assessment (PISA) survey of 15-year-olds in 2006. It showed that only 8 percent of Japanese students expected to have a science-related occupation at the age of 30 — the lowest proportion in the world. Although Japan's children may get good grades in these subjects, it appears that they do not wish to work in science- and technology-related jobs. At the same time, it is also important that people appreciate science and technology not just as mere tools but also as a great cultural artifact that has been built by all mankind. The days when it was thought best to leave matters in the hands of specialists tied down to narrow specialized fields are gone. The time has come for each and every citizen to think about the ways in which they interact with science. Achieving this calls for a new goal. This was the situation in Japan at the end of the twentieth century when the new concept of science communication was born. However, the Japanese government still focused on education, understanding and interest with regard to science. The government enacted the Science and Technology Basic Law in 1995 with the aim of raising the standards of science and technology in Japan, and set out the 1st Science and Technology Basic Plan, a five-year government plan that included the promotion of public understanding of science.

In the UK, the Select Committee on Science & Technology of the House of Lords published its *Third Report: Science and Society* [House of Lords, 2000] and the report *Science and the Public* [Office of Science and Technology, and Wellcome Trust, 2000] was also published in light of the BSE outbreak. This marked a shift in the science and technology policy of the UK government toward promoting public engagement with science. The Japanese Society for Science and Technology Studies was founded in 2001. Japanese researchers in the field of science and technology studies have sparked a new wave of public engagement with science in Japan, holding events such as consensus conferences on the topic of gene therapy. Preceding this, two reports championing science communication were published in Japan, one proposing the establishment of "science communication plazas" [Nakamura, 1991] and the other proposing the founding of "science and technology communication centers" [Nagahama, Kuwahara and Nishimoto, 1991]. The former proposal was realized in 1993 in Osaka, Japan with the JT Biohistory Research Hall, a unique research center with exhibitions open to the public. The latter proposal was for facilities such as science and technology study (STS) centers and has yet to be realized despite being the focus of a report published by a government think tank, the National Institute of Science and Technology Policy (NISTEP). An informal meeting held by the Minister of Science and Technology ventured that "Interpreters who can explain cutting-edge science topics to the layperson are essential." Consequently, early inroads made by the science communication movement in Japan were driven by government promotion based on the "deficit model" or people in the academic field of STS within their community. This was one reason why science educators and science center personnel who had been supporting the public understanding of science since the 1960s were unfamiliar with the new concept and practice of science communication.

Phase 2: introduction of science communication policy

The situation changed dramatically from 2003 onward. The new concept of science communication and interactive two-way communication about science spread amongst science communication practitioners. Several things coincided in 2003. First of all, two publications appeared. One of them was a Japanese edition of *Science Communication in Theory and Practice* [Stocklmayer, Gore and Bryant, 2001]. The other — which has been most influential — was a report titled *Research on the Promotion of Public Understanding of Science & Technology and Science Communication*

[Watanabe and Imai, 2003] published by NISTEP. It served to change government policy and trigger a cascade effect. In 2004, the new term in the Japanese language "science communication" first appeared in the *White Paper on Science and Technology*. Furthermore, the 3rd Science and Technology Basic Plan from 2005 announced the promotion of science communication. Since then, Japan's policy for promoting public understanding of science has shifted to public engagement. Formal training courses in science communication for graduate students supported by five-year-limited government subsidies, each worth about one million US dollars per institution per year, also began at three universities in 2005: University of Tokyo, Hokkaido University, and Waseda University.

In 2006, Science Agora was started in Tokyo with the support of the Japan Science and Technology Agency. It is an annual forum that aims to be a pivot for a network linking all kinds of science communication activities together. The event is essentially a miniature version of the AAAS Annual Meeting and similar to Europe's ESOF, except Science Agora is admission-free and anyone can attend any session. Science Agora is said to be "like a big salad bowl" [Umehara and Watanabe, 2012] —a wide variety of people, including families, students, teachers, researchers, administrators, politicians, and science communication practitioners, are gathered in one place and mixed together. Science Agora 2016 hosted 213 programs, with roughly 6,000 visitors over the course of four days. Science Agora has fostered network-building among key sectors of science communication. In 2009, a new type of science festival based on the modern concept of science communication was launched in two cities, Hakodate in Hokkaido and Mitaka in Tokyo (these two cities have no science centers). This was an additional side effect of Science Agora. These festivals have built up positive reputations and a number of other cities have launched their own new-type science festivals.

A further example of the rise of science engagement opportunities is the emergence of science cafés, with more than 1,000 having been held since 2009 around the country every year. They were originally convened in response to an appeal from the Science Council of Japan during the 2005 Science and Technology Week, when such café events were held in more than 20 places across the country. Although they may have begun as a somewhat top-down contrivance, they have subsequently sunk down firm roots throughout Japan.

It is amazing that science cafés have become so popular in Japan because the country does not have the same level of preexisting "café culture" that is found in some European countries. This author conceives that before science cafés, science was thought of as a high-threshold topic, but these events are now perceived as being open to all comers thanks to the relaxed, informal environment where people enjoy talking about science over coffee. It can be compared to the *idobata kaigi*—the "well-side chat," or, in other words, the neighborhood gossip session. This author wants to believe that if these science cafés — which are held in all manner of locations and venues — can be linked up as a network, they will eventually fall into sync and turn into a substantial movement.

The critical factor explaining why the new concept of science communication has become popular so quickly in Japan can be attributed to the new key phrase and concept of "science communication" having been introduced first. There is some truth to the old dictum, "new wine must be put into new wineskins"[Watanabe, 2010]. The situation furthermore resembles that which followed the introduction of Western science about 150 years ago.

Another unique part of Japanese culture has also steadily been making inroads into science culture. Artists in the fields of manga and anime have been skillfully incorporating science into their work. To offer one example, the manga *Moyasimon: Tales of Agriculture* [Ishikawa, 2005], which is popular in Japan, is a story that cleverly introduces a wealth of knowledge about fungi and other microorganisms, as well as the fermentation process. Scientists with a mindset of science communication have also made adroit use of *Moyasimon* in special exhibits about microorganisms at science museums that have become a topic of conversation among younger generations. Furthermore, many young researchers majoring in microbiology have confessed that their interest in this field was influenced by the manga *Moyasimon*.

Phase 3: corrected policy

A large-scale earthquake hit Japan on March 11, 2011 and caused a sequence of explosions at the Fukushima Daiichi Nuclear Power Plant. It revealed the almost complete absence of a government policy on science communication. The government and scientific community experienced a great loss of public trust as a result of this disaster. The government was found to have concealed information about radiation data because they wished to avoid a resultant panic. Failure to release radiation data during the early stages of the crisis is said to have delayed evacuations of communities located near the plant. At first the government was unable to recognize the meaning of the data, and later pursued an official campaign to play down the scope of the accident and the potential health risks in order to prevent panic as mentioned previously. This policy went counter to the science communication policy of openness and transparency. It revealed a fundamental misunderstanding by the government regarding the idea and concept of science communication despite its previous declarations promoting science communication in the 3rd Science and Technology Basic Plan. On the other hand, most of the Japanese scientific community kept silent about the nuclear power plant accident. Some nuclear power engineers did appear in initial TV news broadcasts as commentators. However, most of them disappeared from the public view after the hydrogen explosions at the plant.

The government intended to publish the 4th Science and Technology Basic Plan and *White Paper on Science and Technology 2011* at the end of March 2011. Ironically the basic plan would declare that science and technology policy should be created together with society, i.e. through democratic participation in science and technology policy-making. The public announcement of the basic plan was delayed four months. Another irony was that one of the main topics of the white paper was science communication. Of course the publication was also delayed and the content was revised. A trustworthy relationship is the most important aspect for establishing science communication. The Japanese government should follow the example of the British government in the wake of the BSE outbreak in changing its policy to one of openness and transparency.

The Japanese public learned a great deal after the March 11 earthquake and the Fukushima nuclear power plant accident. Since then people have been setting up their own local networks to exchange information about radiation risks. For example, many regional communities have procured their own Geiger counters and begun monitoring radiation levels in their local areas. On top of this, over 30 science cafés about radiation effects or the earthquake were held all over Japan during the two and a half months immediately following March 11. This unfortunate incident has taught us a major lesson and encouraged people to adopt a bottom-up approach. Toward the end of 2011, the Japanese Association for Science Communication (JASC) was established. The mission of JASC is to construct a network of science communication practitioners and to propagate and share the concept and methods of science communication across all communities nationwide. The association started out with about 200 members and has since increased to roughly 400. It operates self-sufficiently using just membership fees.

Conclusion

Japan's policy of "public understanding of science" has shifted to "public engagement with science" since 2003. That year, there were a number of simultaneous developments with regard to science communication. The key report that advocated for the promotion of science communication and a textbook on science communication were published. The most important consequence was that the report triggered a change in government policy. Although the shift may have begun as a somewhat top-down contrivance, it has subsequently sunk down firm roots throughout Japan.

Things changed dramatically in the wake of the large-scale earthquake and the Fukushima nuclear power plant accident on March 11, 2011. The Japanese government had to change its science and technology policy, and the public gained the realization that the government is not necessarily trustworthy and people have to look out for themselves. This would appear to be counter to the principles of science communication. Nevertheless, at a local community level people have acted with great generosity and established solid links amongst themselves. A light of hope can be found there. An updated version of science communication, i.e. "Science Communication 2.0," must be launched. For this we must look to grassroots science communication.

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Author

Masataka Watanabe is the science communicator and professor in Public Relation Office, University of Tsukuba. He is also the adjunct professor in Nihon University. Watanabe is also a scientific council member of PCST, and the president of Japanese Association for Science Communication. He is a famous science writer and has researched history of science and evolutionary biology for over 30 years. He is an author of six books and a co-author of four books about science communication, history of science and evolutionary biology. He also translated over 50 English popular science books into Japanese including almost all books written by Stephen Jay Gould. E-mail: watanabe.masataka.ft@un.tsukuba.ac.jp.

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