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The Learning Experiences of Participants of Science Cafés in Japan

1. Introduction

Many efforts in remedying the issue, "decline of interest in science" among Japanese people, it is not only decline of children's level and motivation in learning science but also ordinary citizens' poor interest towards science and ignorance of advantages of science. While such social phenomena have been reported frequently, there are few studies on the specific characteristics of people who have interest in science so far.

In this research, we tried to reveal what kind of learning experience evokes interest towards science, which persists throughout the school ages and remains even at the adult ages. In order to make the research, we chose participants of "Science Cafés" which are the places for scientific experts and ordinal citizens, who are not necessarily familiar with science, can communicate more casually.

2. Literature Review

2.1. "Decline of interest in Science" in Japan

In Japan, there is a word called "decline of interest in science". Its definition is various. Saito and Takahashi(2005) has done research in the cause of "decline of interest in science" as a crisis of scientific ability among students. Also from the result of PISA, Japanese 3rd year students in lower middle high school has a low interest and awareness of availability of science (Ministry of Education, Culture, Sports, Science and Technology 2003). This is also reported among adults (Ministry of Education, Culture, Sports, Science and Technology 2001). Kobayashi (1993) called this phenomenon as "decline of interest in science and technology" and it has been problematic in the course of raising science experts and engineers also from the aspect of STS; science, technology and society. Kakuya and Muto(2004) imply that "decline of interest in science" is not only the problem of science but it is happening as a decline of interest in learning as whole. Considering those past researches, in this paper, "decline of interest in science" is defined as a decline of interest and academic ability of science that happens among children and also adults. The word science includes mathematics, technology and engineering.

2.2. Science Café and its situation in Japan

In order to promote the scientific literacy of citizens, science cafés have been unique events for citizens to learn about science and to be interested in the issues, which are related to the areas of trans-science(Sugiyama b 2007).

Science café itself started in England; however, its origin is traced to Café Philosofique in France. It was brought to Japan about 2004(Sugiyama a 2007) and expanded broadly. Its styles and themes are diverse so that it is difficult to define what the science café is. The main purpose of Science Café is the interaction between scientists and citizens with a cup of coffee at the places such as cafés (Fukunishi 2007).

2.3. Process of creating interests towards Science

There are various patterns to create the interests towards science. The phenomenon of "decline of interest in science" is due to the decline in willingness of scientific learning (Saito and Takahashi 2005). From the research of Mizuma and Aso (2005), attitudes towards science are different for each student and can be shown as the developmental process. The process in the experience of wonder depends on feeling of wonder, eagerness for solutions, willingness to solve by oneself, willingness of tackling problems and development of further questions. Each of these steps appears in the attitudes of students; asking all of question to teachers, reading the encyclopedia, experiencing rather than searching, asking someone as well as making research by oneself and developing further research. Students in the developmental stages are characterized into 5 types; solving type, grazing type, experience/venture/ adventure type, hobby type and methodology type.

There is an implication of a gender difference in motivation towards science learning(Inoue and Ikeda 2008: Kakuya and Muto 2004). Generally male students like science more than female students. Female students explain the reason of their declining of interest in science is that science is not related to the job they want to get. Other research by Takasu et al. (1981) focusing on one school showed that female students who like science had liked plays which involved a lot of activities in their childhood, however, the result says that is difficult to trace the effect is caused by biological or social or domestic factors or teachers.

Aso and Amagase (2005) claimed that there is a relation between the willingness towards science and the experience of the nature in the childhood; however, what kind

of experience remains until they become adult is not yet clarified scientifically. Other factors such as teachers, home environments and children's science books also influence the interest towards science.

3. Research Result

3.1. Purpose and Content of Research

The present study tries to reveal how past learning experiences of participants of science cafés in Japan affect their current interest in and attitudes toward science. The study consisted of two parts, questionnaires and interviews on participants of two of the science cafés held in Tokyo. We could obtain 50 questionnaire responses and 10 interviewees. The participants, at first, answer the questionnaires, then later we chose 10 interviewees. Each interview lasted about an hour. The attributes of interviewees are as follows (Figure 1).

Interviewee	Age	Sex	Occupation	Academic Background/ Major
Interviewee A	60s	M	Office Worker	Electrical engineering
Interviewee B	60s	M	Office Worker	Philosophy
Interviewee C	40s	M	Office Worker	Electronics
Interviewee D	40s	M	Office Worker	Japanese Literature
Interviewee E	40s	F	Office Worker	None（junior college）
Interviewee F	30s	M	Office Worker	Industrial engineering
Interviewee G	40s	M	Public Employee	Mathematics
Interviewee H	30s	M	Public Employee	Electrical engineering
Interviewee I	50s	F	Teacher	Education (Chemistry)
Interviewee J	20s	F	Student	Physics

Figure 1: Attributes of Interviewees

3.2. Result of Questionnaire

The participants who answered the questionnaires are mostly male (Figure 2). Takasu et al.(1981) and Inoue and Ikeda (2008) has done researches on junior high and high school students about gender difference in interests towards science; however, it does not reflect differences of science and mathematics, neither biology, physics, chemistry and earth

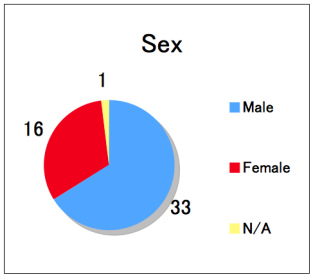

Figure 2: Sex

science. Therefore, it is needed to have done further research on gender differences.

Most of the participants collect information about the café through the Internet (Figure 3). This question allowed plural answers. There are various websites with a lot of information about science cafés. On the other hand, introduced by friends marked low. It can be said that those participants are likely to have their own interests which is not affected by others much. Whether or not they participate in the particular science café mostly depends on the themes or guest speakers of the science cafe.

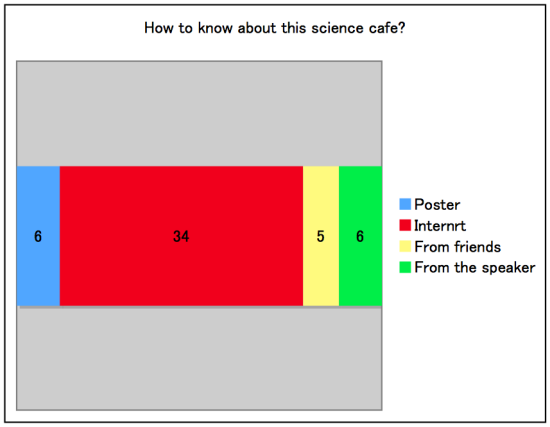

Figure 3: How to know about this science cafe?

Answers for "Have you ever been to the events which relates to science?" showed most of participants has already had experience of participating in events of science (Figure 4). This shows that the difficulty of including new comers for science cafes. Also according to Figure 5, most of them were interested in science already when they were little. And interest towards science is derived from various reasons such as experience in Nature, book or media, scientific contents and family or friends. Therefore, it can be said that participants of science cafes has already had their own interest towards science.

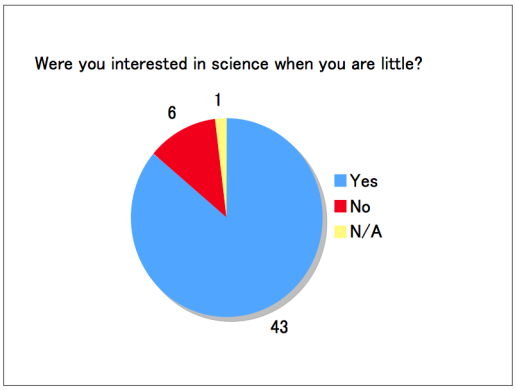

Figure 4: Were you interested in science when you are little?

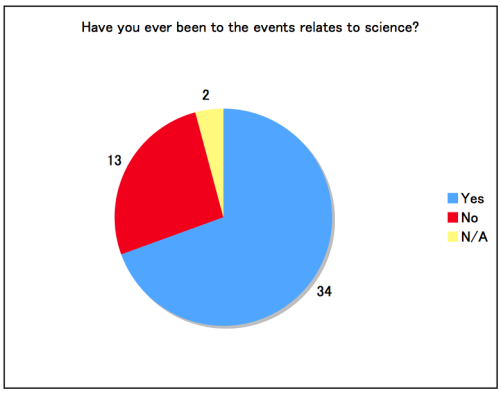

Figure 5: Have you been to the events relates to science?

Their favourite subjects, allowed plural answers, are not limited within science or

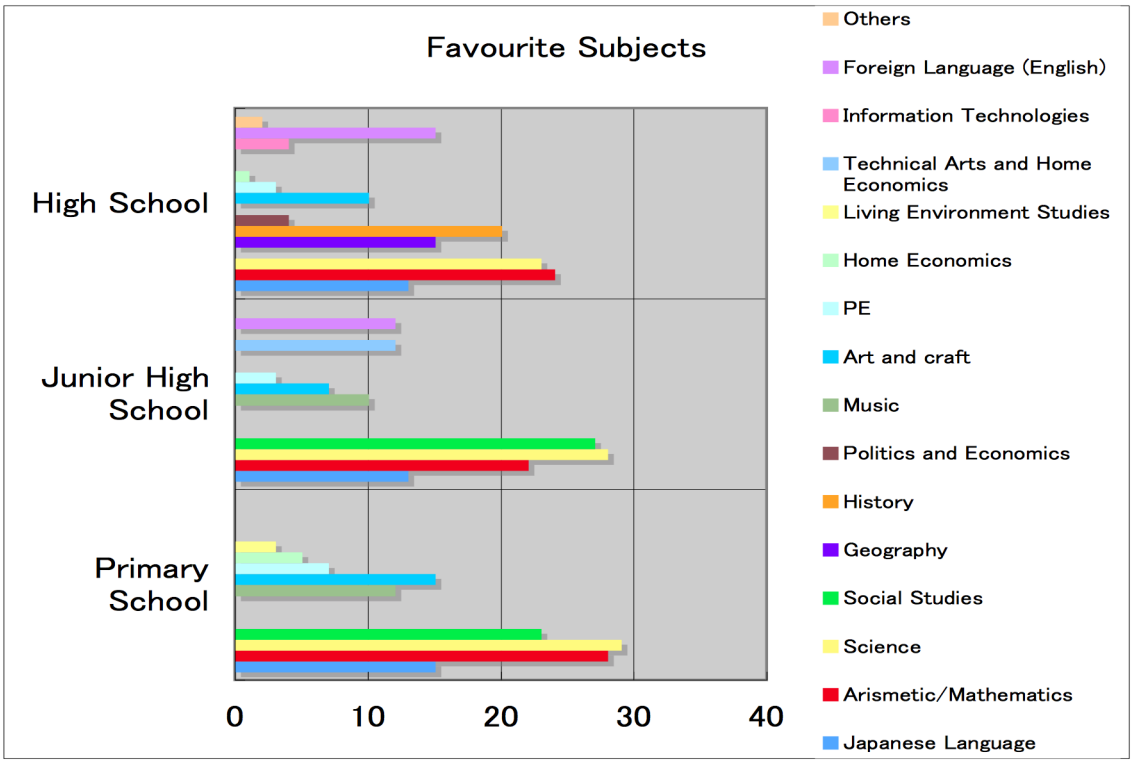

Figure 6: Favourite subjects

math but they vary widely. At the primary school level, Arithmetic and science scored high number, but they chose social studies too. This phenomenon keeps up to junior high and high school level.

Not all of the participants have had experience in the Nature. The kinds of the experience in the Nature depend on the person.

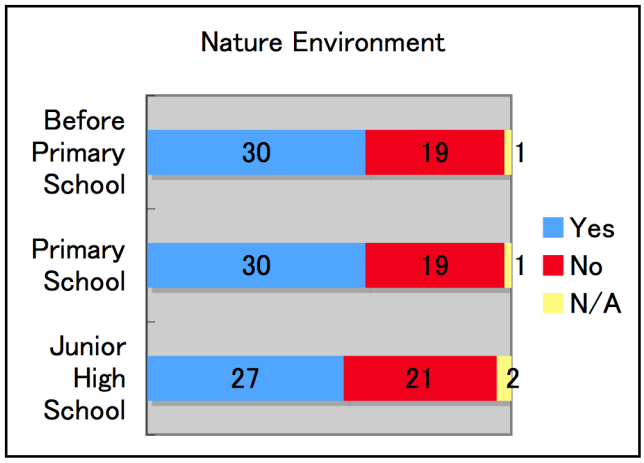

Figure 7: Nature Environment

3.3. Result of Interview

From the interview data, 8 factors have indicated; science book for children, library and books, curiosity and literacy, handcraft and experiment, nature environment, relationship between science and other subjects, teacher and family or brothers/sisters.

Firstly, Japanese science books for children influenced their interest a lot. Some participants were eager to read those science magazines for children; however, others were unconsciously reading those books in their childhood. They took books which

says about science with interesting supplements drew children' attention. Secondly, the participants are familiar with libraries and reading books. Going to the public libraries and books stores is so as to know what they want to know. Also they simply likes reading books. They seem to get used to doing research on their own questions. Thirdly, they are very curious about many things and one of their motivations of participating in science cafes is to acquire culture. They have a sense of wonder and feel pleasure with knowing new things. Fourthly, some of them experienced impressive handcraft and experiment during adolescent. In Japan, because experiment takes time to prepare and have done, some teachers avoid them as much as they can. The participants, on the other hand, have done experiment during summer holiday or borrow some materials from family or relatives to make handcrafts. Fifthly, they have lived with nature environment and played outside a lot; however, the relationship between natural environment and interests towards science is not revealed clearly according to the literature review. From those interview, one of the implications is not only experiencing natural environment, but also research on what they felt within nature or talk about it with someone grows their interest towards science up. Sixthly, due to the entrance examinations for university is very important for people in Japan, whether they scored good marks on tests of natural science subjects or not affect their attitude towards science. Sevently, teacher is not only the gate for their curiosity in science, but when they support children's interest well, they keep their interest long. It relates to the eighth factor, family. If their family is keen to educate their scientific knowledge and thinking, they will provide some books or take them to science museums. This stimulates children's interest. Or when their parents or sister/brother majored in science or works with science, children receives a good environment of flourishing their scientific problems.

Those findings indicated most of the participants were interested in science in their childhood and their favorite subjects were not only science but also other subjects such as history. Also, they had some experiences relevant to science through media and books. However, they received that information unintentionally. Their major reasons for participating the science cafés were just to cultivate themselves or learn about contemporary social issues, and were not necessarily linked directly with science itself, because science and technology components were usually involved in most of the social issues. Other characteristic of the participants was their 'activism.' Participants are, in

other words, very active in exploring or investigating what they are interested in. Besides attending to the science cafés, they also attended to public lectures and they often visited libraries and bookstores to get answers to their own questions. However, where this 'activism' comes from is still an open question.

4. Conclusion

In conclusion, the phenomena of "science declining" may be attributed not to disliking science but to disliking learning itself. People who have the interest towards science gain the interest in the early ages. This is influenced by the environments and activities; nature environment, science liking parents or brothers/ sisters, information sources on science such as books and media, teachers' support in increasing the interest, activities relate to handcrafts and so on. It leads people to be interested in science, but the genre of science such as chemistry, physics, biology, earth science, mathematics, technology are all different. As a result, people such as the participants of science café have the interest towards science in the childhood and their interest remains after they become adult. Those who have had such experience, make actions, which are related to the interest towards science. And to be interested in curiosity and literacy. More importantly, they can actively take action for what they are interested in and what they wonder. One of the implications from this study is that school teachers may need to support and encourage children (future citizen) to cultivate their own curiosity and to be active. Further implications will be also presented.

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