

The Report of Nuclear Technology Seminar 2019 held in Japan

***Basic Radiation Knowledge for  
School Education Course***

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# Report of Nuclear Technology Seminar 2019

## ***Basic Radiation Knowledge for School Education Course***

Organized by Nuclear Human Resource Development Center, Japan Atomic Energy Agency  
(JAEA) 2-4 Shirakata, Tokai-mura, Naka-gun, Ibaraki.319-1195 Japan

From 24<sup>th</sup> October to 8<sup>th</sup> November 2019

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Sponsored by: Ministry of Education, Culture, Sports, Science and Technology (MEXT) of  
JAPAN

Nominated by: Sri Lanka Atomic Energy Board, 60/460, Baseline Road, Orugodawaththa,  
Wellampitiya and Science Branch, Ministry of Education, Battaramulla, Sri Lanka

### **1. INTRODUCTION**

Basic Radiation Knowledge for School Education Course was conducted by JAEA as a part of an Instructor Training Programme (ITP). It had been launched in 2012 to disseminate the basic knowledge of radiation in public and school sector after the Fukushima Daiichi Nuclear Power Station accident in 2011. The course provided participants with both the theoretical knowledge and practical skills in radiation. Objectives of the course were; to expand knowledge on radiation and radiation effect, to exchange information on educational programme of radiation in Asian countries, to acquire skills and methods for developing a teaching programme and for meeting the educational needs. There were 16 participants from 9 countries including Sri Lanka, Bangladesh, Indonesia, Republic of Kazakhstan, Malaysia, Philippine, Thailand, Turkey and Vietnam.

Objectives of my visit were; to enhance the knowledge on radiation and nuclear technology which will be expanded in junior secondary level science curriculum under the new educational reforms and to be a good instructor to the students who wish to follow the modules which is going to be introduced by Sri Lanka Atomic Energy Board. Further, experiences obtained through the seminar will be useful for activities of science society and energy club.

### **2. PROGRAMME**

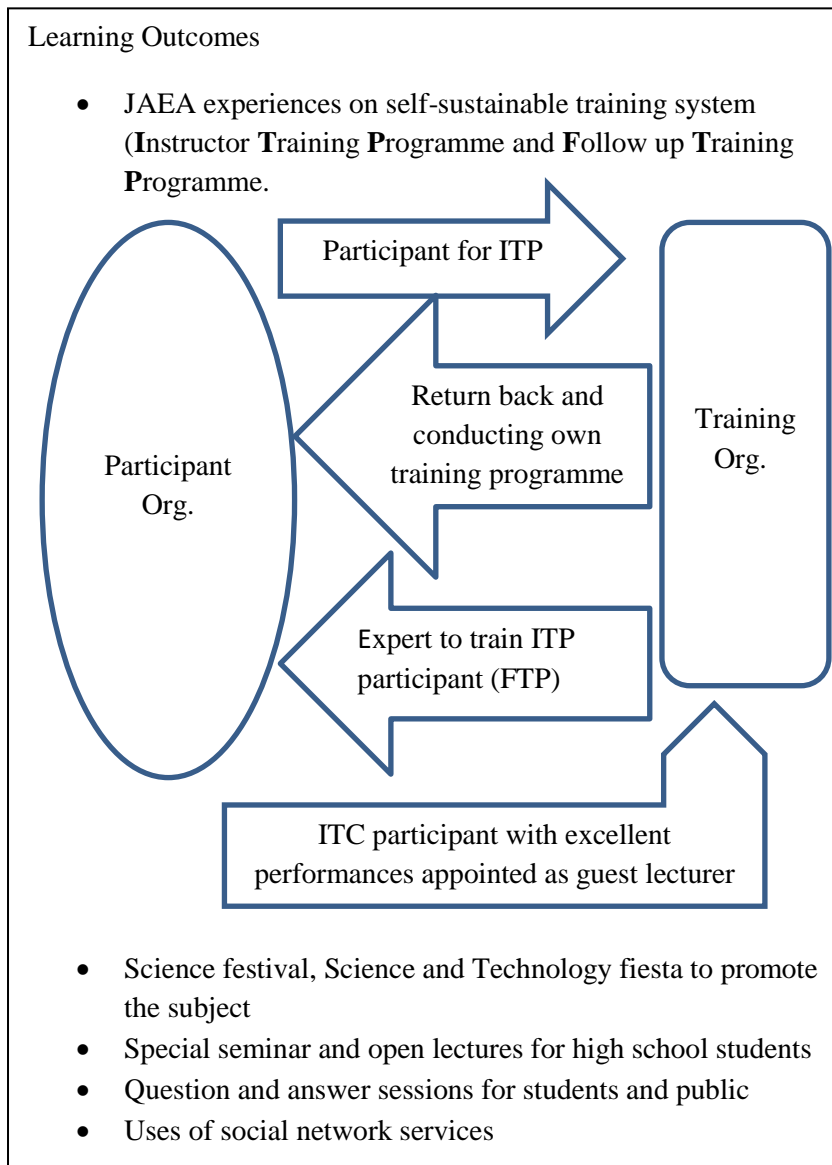
**Day 1**            24<sup>th</sup> October 2019

Orientation programme was conducted and general information was given

**Day 2** 25<sup>th</sup> November 2019

Course guideline and safety precautions were discussed. Course curriculum was consisted with 8 lectures, 3 exercises, 8 facility visits, 1 group discussion and 2 presentations.

Public relation activities of JAEA and their challenges, outline of Instructor Training Programmes (ITP) were discussed in the morning session. Participants were introduced themselves in the afternoon session.



Course coordinator Ms. Watanabe



Participants for the course



Conducting lectures at JAEA

**Day 3** 24<sup>th</sup> October 2019 - Holiday

**Day 4** 24<sup>th</sup> October 2019 – Holiday

**Day 5**                      28<sup>th</sup> October 2019

Lectures on The Basic Radiation and Radiation Protection, Important of the Radiation Education, Outline of Fukushima Accident and Exposure situation were conducted. Principle and craft of a diffusion type cloud chamber was exercised.

Learning Outcomes

- The basic knowledge on radiation
- Radiation effects on human body
- Radiation doze
- Protection from radiation exposure
- Radiation measuring and monitoring
- Various applications of radiation
- What happened in Fukushima Daiichi NPS accident, Radiation exposure and contamination, Decommissioning of Fukushima NPS
- The principle of cloud chamber and how to make a diffusion type cloud chamber
- Alpha and beta particles were observed through the experiment



Preparation of cloud chamber



Observing radiation

**Day 6**                      29<sup>th</sup> October 2019

Our first field visit was to Japan Atomic Power Company (JAPC) Tokai No 2 Power station where low enriched uranium was used as the fuel with a boiling water reactor to get a 1,100,000 kW electric output. Then we visited to the Ibaraki Museum of Nuclear Science. A lecture was conducted under the topic of “Biological Effects of Radiation and Radiation Effect on Human”

Learning Outcomes

- Component of a nuclear power plant
- Mechanism of a boiling water reactor
- Fuel assembly and nuclear waste management
- Mechanism of supplying a stable and high quality power supply every day in accordance with “Safety First Policy”
- Learned basics about atom, atomic energy, utilization of radiation and prospective future technologies through the exhibitions in the museum and enjoyed.
- Radiation effect on cell cycle, chromosomal level, hereditary effect, stochastic effect learned through the lecture.



Explaining about the JAPC plant



Ibaraki museum of nuclear science

**Day 7** 30<sup>th</sup> October 2019

A lecture was conducted on “Introduction to nuclear reactor”. Joint exercise with high school student was carried out to measure radiation using survey meters in the afternoon session.

**Learning Outcomes**

- Fundamentals of nuclear reactor, light water reactor, and generation of electricity by nuclear reactors, features of boiling water reactors and pressurized water reactors, safety of nuclear reactors and research reactors were learned through the lecture.
- Scintillation survey meter and GM counter used to measure radiation during the joint exercise.
- Background radiation, radiation related to the distance and radiation related to shielding materials were measured.
- The way of organizing practical session effectively to give selected fact directly to the student.



Measuring radiation using survey meter



High school students participated to the exercise

**Day 8** 31<sup>th</sup> October 2019

Japanese experience on Radiation Education was discussed with Prof. Takeshi Iimoto in the morning session. There were two facility visits to the Whole Body Counter and Nuclear Emergency Assistant and Training Center.

**Learning Outcomes**

- Japanese effort to insert “WOW factors” into their radiation education. (two hours radiation education programme, supplementary materials, experiment, hakura-kun project etc.)
- Instrument to measure internal radioactivity by detecting gamma rays from radionuclides in human body for internal dosimetry (direct method)
- The way of monitoring and provision of technical advice and prompt dispatch of experts to the government and the public in an event of nuclear or radiological incident.
- The process of contamination screening by providing equipment and environmental radiation monitoring in a radiological/ nuclear logical disaster.



WBC – measuring K40 content inside the body



Nuclear Emergency Assistant and Training Center 4

**Day 9** 1<sup>st</sup> November 2019

Facility visit to Reprun Fukushima and Fukushima Daiichi Nuclear Power Plant was the most stimulating and exciting day of the training programme.

Learning Outcome

- Decommissioning process of Fukushima was studied at the TEPCO decommissioning archive center.
- Current status at the Fukushima Daiichi Nuclear Power Station; Situation inside the power station, working conditions of workers and effects of surrounding area were observed.
- Contaminated water management, Frozen soil wall to block the inflow of underground water into unit1-4, fuel removal from spent fuel pools, fuel debris retrieval, waste management methods were observed.



TEPCO decommissioning archive center



Storage site of contaminated soil of Fukushima

**Day 10** 2<sup>nd</sup> November 2019 - Holiday

**Day 11** 3<sup>rd</sup> November 2019 - Holiday

**Day 12** 4<sup>th</sup> November 2019 - Holiday

**Day 13** 5<sup>th</sup> November 2019

There was a facility visit to National Institute of Radiological Science (NIRS) in Chiba prefecture and a lecture on “Introduction of Radiation Emergency medicine” by Dr. Hideo Tatsuzaki from Quantum Medical Science Directorate.

Learning Outcomes

- Characteristics of radiation accidents
- Types of RN terrorism incidents, dirty bomb, CBERN terrorism etc.
- Steps in radiation emergency medicine as a safety net.
- Life supporting emergency medicine, radiation measurement, dose assessment, information collection, assessment of total situation, medical treatment and radiation safety.
- Advantages of Heavy Ion Medical Accelerator in Chiba (HIMAC) which is the first machine in the world specially constructed for researches on heavy ion radiotherapy as cure for intractable cancers not curable by surgery nor conventional radiation.



Preparation for receiving contaminated patients



Explaining HIMAC mechanism

**Day 14** 6<sup>th</sup> November 2019

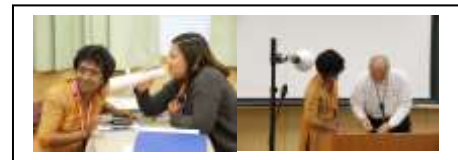
Group Discussion was held to make a radiation education programme for student and to make a radiation communication plan for the general public. Environmental Monitoring Center of JAEA was our final facility visit. Public Information and Media Training lecture was conducted on activity basis.

Learning Outcomes

- How to give an effective presentation
- Sharing experience with other countries
- Verbal communication and non-verbal communication
- World common seven facial expressions through the activities
- Importance of public information activities
- Component of an environmental monitoring section
- Monitoring process of radiation doses and radioactive concentrations in and around JAEA
- How they are conducting dose survey, radiochemical analysis of the environmental samples and meteorological observations.



Group discussion



Activity base media training



Environmental Monitoring Section

**Day 15** 7<sup>th</sup> November 2019

Basics of Radiation Protection and Decontamination Technique and Radiation protective gears were practiced. Radioactive waste Management was the topic of afternoon session lecture.

Learning Outcomes

- Selection of protective gear according to the accident situation in terms of the life safety the highest priority
- Learned and understood what it is like protective gear, put on and take off procedure
- Types of masks, suitable gloves, Protective suites, Boots and caps



Selection and put on procedure of protective gear

- Had the experience of decontamination work as a mock radioactive contamination
- Way of skin decontamination
- Function of surfactant,
- Objective and principles of radioactive waste management
- Sources of radioactive waste and classification of radioactive waste
- Treatment for low level radioactive waste and management of high level radioactive waste.
- Transportation of waste



Skin decontamination of hand

**Day 16**      8<sup>th</sup> November 2019

Group presentation on “Importance of Radiation Education Programme” was presented. Certification was given after the course evaluation.

- Learning Outcomes**
- According to the group discussion 13-16 age category of the student were selected for radiation education program.
  - One hour per week was suggested as the time duration
  - Drama, e- learning materials, exhibitions, facility visits, experiment, and lectures were suggested as teaching methods.
  - Mothers were selected as the target group for making radiation communication plan for the general public.
  - Mass media, open discussion, Exhibitions, questioning and answering sessions were suggested as teaching methods of mothers.
  - Total time horizon of radiation education program was 40 years



Group members



Expressing my sincere gratitude to JAEA



Presentation of certificate



### 3. OTHER ACTIVITIES



JAEA welcome party to introduce Japanese food



Ikebana – Japanese flower arrangement activity (Lunch break)



Lunch Discussion with high school children (Cultural exchanging)



Japanese Traditional Tea Ceremony by high school students

### 4. CONCLUSION

- Basic Radiation knowledge for school education course was an effective and a great experience as a teacher.
- There were practical basis activities which can be applied to our classrooms also
- Supplementary reading materials were provided and they were very important as a beginner of the subject.

### 5. SUGGESTIONS

Radiation is around us all the time and used for different field of our life. (Agriculture, food, medicine etc.) Nuclear technology also use and it is expanding all over the world. Therefore system needs professional with highly qualified and also public should have basic awareness on the subject. Therefore, it is better to give basic knowledge on radiation and nuclear technology to each and every student through common science subject. Students who wish to study the subject furtherer should have the path until he/she become an expert.

Vital use of radiation and nuclear science bring us to nuclear emergency/ exposure situations ( eg.NPP accidents in our neiubour countries, dirty bomb, nuclear terrorism etc.) Therefore, Public awareness is need to protect from unintentional exposure to ionizing radiation or radioactive contamination. Public safety can be ensured through a good radiation education programme in school curriculum. Further It is essential to give students and their teachers access to resource and materials that make nuclear technology fun to learn.

## 6. ACKNOWLEDGEMENT

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- My family members

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Date

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Signature

(R.P. Siriwardhana)