

Strengthening the Nuclear Security Culture by Training at University

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Abstract: The best way to build a robust security system is by imbibing culture in your routine. This can be achieved through practice and exercises. On these lines of strengthening the security culture among the young generation and future leaders, Amity Institute of Nuclear Science & Technology, Amity University Uttar Pradesh, India organized a series of hands-on training workshops with their upgraded laboratory facility, for the workforce having some experience of working in this sector, undergraduate, postgraduate, and high school students. This laboratory has been upgraded with the equipment procured under the Nuclear Security Education Laboratory Upgrade project sponsored by Defense Threat Reduction Agency, with technical support from Texas A& M University and Oak Ridge National Laboratory, US.

To spread the word about the safe and secure handling and identification of nuclear materials, hands-on training sessions were conducted post the basic-lecturing sessions. The response from the other section was very motivating. The workshops revolved around using Radioisotope identifiers, NaI (TI) and metal detectors being used for location assessment of the sealed radioactive sources, and quantitative analysis of the sources present.

Fundamental characteristics like attenuation of radiation with various shields and inverse square dependence of radiation were established. The first workshop was held in collaboration and technical support from Nuclear Security Science & Policy Initiative, TAMU in June 2022. The workshop for undergraduate, postgraduate, and high school students was conducted by AINST faculty. This paper shares the details about the workshops held and the results of the awareness created. Some quick survey questions were put forth to our participants after each workshop and their feedback was analyzed.

The way forward for such initiatives would be to create further awareness about the handling of radioactive sources and their easy identification to ensure no undue doses are received by the public. Further, we are taking this facility online for remote access so that the fundamental characterization of detectors can be accessed by a larger group from their respective institutes globally.

Keywords: nuclear security, handheld detectors, training, workshop, workforce development.

Introduction

Nuclear materials have strategic significance not only for a nation but for all the nations around the globe, irrespective of whether you are a nuclear weapons state or not. In the emerging technology era, the threats are dynamic, and awareness [1-3] is the key to catering to these threats. The International Atomic Energy Agency has set up nuclear security training center to help member states develop capability to tackle nuclear terrorism [4]. Amity Institute of Nuclear Science & Technology (AINST), Amity University Uttar Pradesh (AUUP), India has been actively spreading the word about the safe and secure handling of nuclear materials [2]. Continuing with our efforts for making some small yet sustained initiatives AINST organized a series of hands-on training workshops with the help of their upgraded radiation detection and measurement laboratory facility [3], for the workforce having some experience in working and handling nuclear materials, and for the next generation workforce comprising of undergraduate, postgraduate, and high school students.

The objectives of these workshops are to offer hands-on radiation detection and identification equipment. This enables the handling of normal and emergency situations in terms of the identification of radionuclides present and subsequently their decontamination can be planned.

Exercises were also conducted for the recovery of sources placed in various parts of a room, buildings, and parked vehicles. The intent is to trace the source's location with handheld detectors' help, both overt and covert operations.

The activities were extended to different audiences. To begin with professionals that have worked with sealed/open sources were trained. This was in the first workshop held in the month of June 2022. The constitution of the participants, the topics covered, and their feedback are presented in the subsequent sections.

The next set of workshops was for students from both colleges and schools. Graduate, undergraduate, and high school students were invited to participate in two different meetings, respectively. The college students were trained beforehand with the help of class discussions and presentations and then given a hand on experience with the handheld detectors.

School students were asked to go through a preliminary video to give insights about radioactivity, radiation, and interaction mechanisms. Further they were allowed to operate and handle the detectors for source recovery and verification of fundamental phenomena like the inverse square variation of radiation.

This paper will present the details of the objectives and agenda of the workshop, followed by the analysis of the feedback and some glimpses. Keeping in mind, the availability of participants, majorly three activities conducted between June -October 2022 have been covered here.

Workshop on the applications of nuclear security, June 2022.

The workshop was attended by twenty-two participants and the constitution of the same can be found in Figure 1. The sessions covered focus on the Nuclear Security for Materials out of regulatory control. This included characterization and identification of material out of the regulatory framework and the ways to neutralize the adversary. Further sessions were on radiation detection instrumentation for nuclear security, their functioning and principles of radioisotope identifiers, radiation portal monitors, and personal radiation detectors. This was followed by demonstration of the nuclear security instrumentation i.e., working of radioisotope identifiers of various makes and having distinctive characteristics. Moreover, there were sessions on consequence management for nuclear security events to help understand the framework of the consequence management agencies and the approach employed.

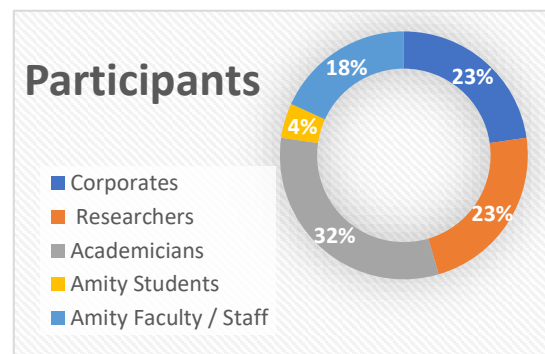


Figure 1: Participants: Workshop June 2022

The workshop had an equal share of exercises which included search exercises. Wherein sources in a room (hidden at various locations to be traced with the help of Radioisotope identifier (RIID) and survey meter), building (source placed in a room and entire floors to be traced for localization), vehicle checkpoint tabletop exercise where, a strategy was to be devised for placing the checkpoint which had limited resources and trained workforce. The tabletop exercise and discussions are to train the participants on handling situation with limited assets available and looking at the most vital components that are to be protected.

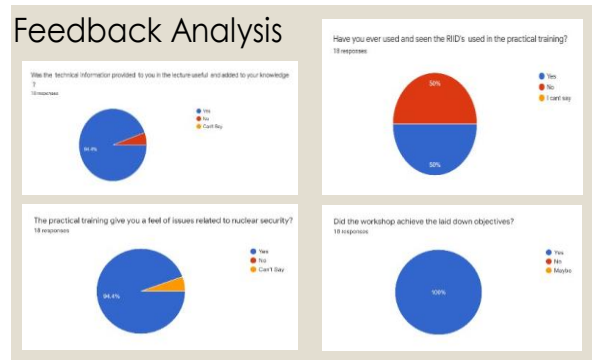


Figure 2 Feedback of the workshop June 2022.

Radiation field mapping exercises, wherein an accident was simulated and with the help of mobile phones (as detectors) radiation mapping was conducted. This was to ensure the participant are trained to decide and ensure that while being a radiation worker crucial decision regarding the approach to be taken for a survey and grey areas wherein, we do not need to explore. Since, we must ensure no unnecessary doses are received by anyone as per the ALARA [5] principle. This will train them to cater to emergency response and with help of available radiation detectors, detect, identify, and localise the areas of highest radioactivity.



Figure 3 Glimpses of the June 2022 workshop.

the feedback was sought from the participants through a Google form and the findings are presented in Figure 3. It was found that majority of the participants had value addition by attending the lectures and demonstrations. Some had previously handled the detectors in other forms but the applications in the security arena were an add-on.

Hands on Training on Radioisotope Identifiers (RIIDs) - 5,7 & 8 September 2022.

This training program was executed for university students of graduate and undergraduate levels. There were students from various institutes of Amity University.

The first two days they were given lectures and demonstrations with regards to radiation detection and

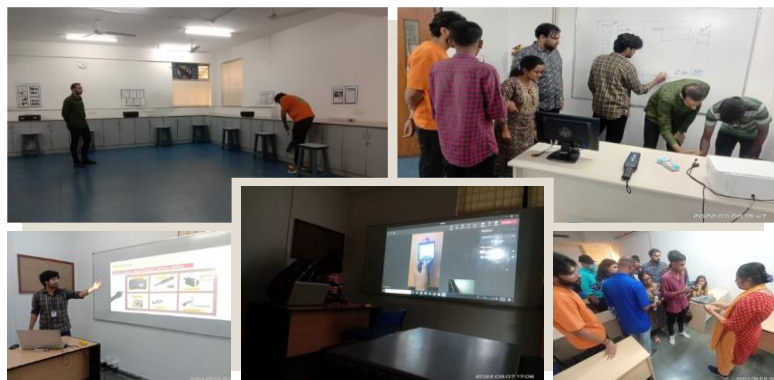


Figure 4 Glimpses of the hands-on training for University Students, September 2022

equipment. Subsequently, third day they were asked to independently handle the equipment. Similar set of activities like the ones organised in the June workshop were done with the students. The students were enlightened to handle the detectors independently and asked for extension of such activities to medical facilities utilising nuclear materials. The glimpses of the training can be found in Figure 4. The feedback sought was analysed and has been presented in Figure 5.

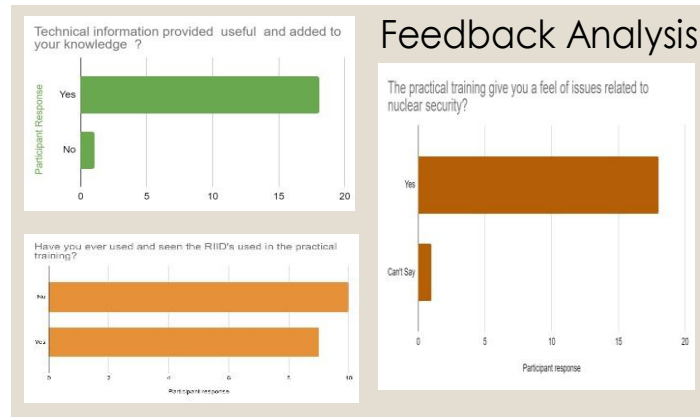


Figure 5 Participant Feedback for Hands on training for University Students

Curie-osity Radiation in Daily life: A Hands-on Training for School Children, October 20, 2022.

Forty-four students of higher secondary visited the department for a hands-on training session with radiation detection equipment. The students were given a preread content in the form of a recorded presentation to give fundamentals of radiation detection and interaction mechanisms. Further a lecture and demonstration were arranged on the day of the visit. Post the session some questions were asked, and students were awarded for successfully responding. During the session in the laboratory, they were given an opportunity to operate and use the equipment and appreciate their working. Incidentally, they

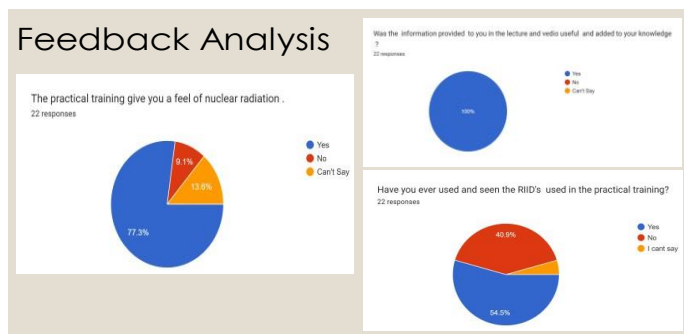


Figure 6 Participant Feedback Curie-osity, the workshop for School Students, October 2022



Figure 7 Glimpses of the Curie-osity Workshop for School Students

were quick enough to adapt to the functioning of the equipment. The overall feedback (Figure 6) of the students was positive, although only twenty-two out of the forty-four participants submitted it. The response during interaction revealed their quick grasp of the concept. Their further interest was to study more nuclear materials.

Conclusions and Future Scope

Feedback sought after the conduct of workshops for different beneficiaries has been analysed and turned out to be encouraging. The participants appreciated the conduct and agenda. The major feedback is to work upon inviting Indian experts who handle radiological and nuclear emergencies. Participants want to interact and learn from the real-life experiences of the first responders. Also, students were keen to understand the thought process behind the students of AINST choosing this specialised stream.

Our motive and intent with these workshops is to primarily create awareness about the course and the stream of Nuclear Science and Technology. But additionally, we would like to spread awareness about the safe and secure handling of nuclear materials and the sensitivity associated with it. With a successful history of operation of nuclear facilities with only a few accidents to talk about, the future energy alternative is surely nuclear power. Our effort is to make people understand and accept the nuclear energy as an alternative since we are already short of energy sources. Also, the pressing problem of the world is the increasing Carbon footprint. To curb this increase and arrest the rising temperatures we must switch to nuclear. Public acceptance to any technology is of prime importance. We are trying to contribute with our small efforts.

We plan to organise such trainings for different stakeholders throughout the year (once every three months preferably). Further we would like to extend these trainings to the first responders to give a hand on the latest equipment available and to help everyone learn from other participants coming from diverse backgrounds. Diversity in participants invokes different line of thought and newer ideas emerge.

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