Global Capacity Building Program in Nuclear Nonproliferation and Security: Historical Development and Strategic Specialization

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1. Introduction

International Nuclear Nonproliferation and Security Academy (INSA) was launched in February 2014 under the Korea Institute of Nuclear Nonproliferation and Control (KINAC) according to the Republic of Korea (ROK) government's commitment at the 2010 Nuclear Security Summit (NSS) held in Washington, D.C., to establish a nuclear security Center of Excellence (COE). The center's core mission is to offer education and training courses in nuclear nonproliferation and security, following the ROK government's policy for the peaceful use of nuclear energy.

For over ten years, INSA has contributed to building regional and global nuclear nonproliferation and security capacity. Through its international education and training program, INSA supports fostering regulatory experts and raising awareness from countries planning to adopt nuclear power. It also provides domestic compulsory education for nuclear licensees and researchers related to the nuclear fuel cycle to ensure abidance of nuclear nonproliferation and security laws and regulations.

Today, preventing nuclear proliferation and securing nuclear material and facilities is more critical than ever to ensure peaceful uses of nuclear energy, which is playing a pivotal role in achieving net zero and guaranteeing a sustainable energy supply. Essentially, education and training are required as fundamental measures for strengthening the nuclear nonproliferation and security regimes. Thus, this paper reviews historical records of the development of the INSA education and training programs, which verifies the achievement of the Korean government's pledge. Further, the center's potentials are discussed for maintaining competitive advantages and ultimately creating strategies for the way forward.

2. Branding Global Capacity Building Program

2.1 Implementing Measures for Nuclear Nonproliferation and Security

By national laws and regulations, KINAC is entrusted with the four implementing measures of nuclear nonproliferation and security: IAEA Safeguards, export control (of the Trigger List), physical protection, and cyber security. Under the same umbrella organization and backed by internal subject-matter experts, INSA has been able to brand its international education and training programs, the so-called INSA International Training Course (ITC).

2.2 Four-Step Model

Among the detailed systematic methodologies and procedures for educational course development, INSA adopted a simplified four-step process in cooperation with the DOE/NNSA [1-3] and IAEA [4], as shown in Fig. 1. Step 1 consists of the development of education and training materials with a preparatory meeting, which keeps all stakeholders (e.g., course director, scientific secretary, instructors, coordinators) in the picture. Step 2 is the train-the-trainer (instructor) session with course materials focusing on not only the contents' objectives and highlights but also the delivery skillset. The dry run, a rehearsal of the main ITC with the secretariat and instructors, is in Step 3. The main ITC is delivered as Step 4 with a loop that improves the course through participants' feedback.

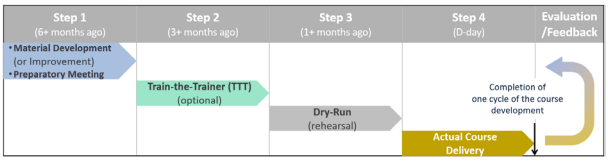


Fig. 1. Four-step course development and delivery process for the INSA International Training Courses

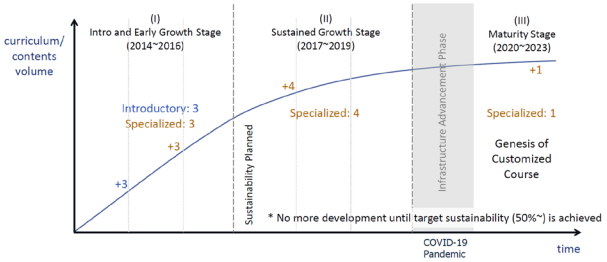


Fig. 2. Three-stage development of the INSA International Training Courses over ten years

Table I: Curriculum of the INSA International Training Courses

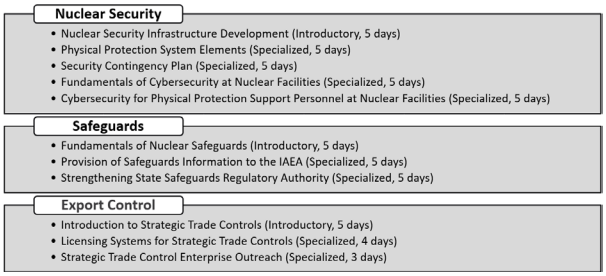
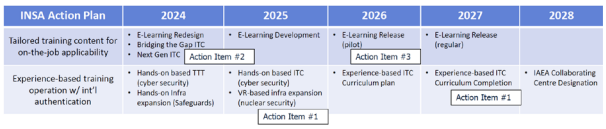


Table II: INSA 2024-2028 Action Plan for Specialization



2.3 Categories of the Curriculum Development

Physical protection has been a fundamental basis of nuclear security; cybersecurity is acceptedly classified as nuclear security. In this regard, the designation of category for both has been integrated into nuclear security for INSA ITCs. Therefore, the curriculum of the INSA capacity-building program comprises three categories: IAEA Safeguards, strategic trade control, and nuclear security. Each has two distinguished levels—introductory and specialized. The total INSA ITC curriculum, developed with the four-step model, is shown in Table I.

Each of the IAEA Safeguards and export control courses has one introductory and two specialized courses, while nuclear security has developed one introductory and four specialized courses, two of which are for cybersecurity.

3. Decade-Long Growth Stages

Figure 2 presents the development of the INSA ITC curriculum on nuclear nonproliferation and security over the past decade, which can be categorized into three growth stages. The first one (2014-2016) was the intro and early growth stage, during which one introductory and one specialized course per category were developed. A total of six ITCs were achieved by applying the four-step model of curriculum development, implying that the ITC was held for every cycle.

Stage 2 (2017-2019) experienced sustained growth, with a focus on developing specialized courses. Four courses were added to the curriculum; the concern about instructors' sustainability emerged at that time. Accordingly, the sustainability plan for instructors was made and successfully completed.

At the beginning of the maturity stage (2020-2023), INSA concentrated resources and capabilities on building education and training infrastructure due to the COVID-19 pandemic, resulting in the development of one specialized course in cybersecurity.

Over the ten years, eleven courses were developed, diversifying educational content, building training equipment, and achieving quantitative outcomes in offering ITCs. From the accumulated training experience and capabilities, INSA designed and delivered country-specific ITCs in 2022 and 2023 that met partner countries' education and training needs, confirming the possibility of customized courses.

4. INSA 2024-2028 Action Plan for the Strategic Specialization

Based on ten years of experience in planning, developing, and running the ITCs, INSA has established three distinctive strategies: (1) experience-based training courses, (2) ITC leading global agenda, and (3) demand-driven curriculum management.

During the infrastructure advancement phase within the maturity stage (2020-2023), INSA developed and upgraded the hands-on training and virtual reality (VR) demonstration equipment. Firstly, INSA plans to integrate them into the ITC towards experience-based training. Secondly, INSA intends to surpass curriculum-oriented training management by hosting INSA events to lead the global agenda, such as bridging the gaps between subjects (or fields). Finally, INSA plans to strengthen the reflection system for training needs. In the maturity stage (2020-2023), INSA experienced the genesis of the customized course; we plan to keep developing this by combining the content and curriculum INSA has achieved. In addition, the course contents under the branding of INSA ITC can be converted into e-learning for blended learning.

The action plans derived from these strategies have been incorporated into the 2024-2028 KINAC Plan to ensure justification and momentum. The INSA action plans are excerpted and summarized in Table II.

5. Conclusions

Reviewing INSA's decade-long achievements, which have demonstrated ROK's commitment and actions showcased in the four Nuclear Security Summits since 2010, it is evident that the Center of Excellence has evolved from a responsible participant, adhering to international nuclear nonproliferation and security norms into a global leader in capacity building. Further, by formulating strategies to enhance its competitiveness as a global center and integrating these action plans into the KINAC five-year plan, INSA has established a solid foundation for implementation and reinforced its momentum through internal motivation.

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