

3-2023

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### Recommended Citation

Alanazi, Ahmed Ahmed M. Alqasimi and Kofi, Mostafa (2023) "Adapting Nuclear Security Education Programs in Arab Countries," *International Journal of Nuclear Security*. Vol. 8: No. 1, Article 4.

Available at: <https://trace.tennessee.edu/ijns/vol8/iss1/4>

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# Adapting Nuclear Security Education Programs in Arab Countries

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## Abstract

Recent times have witnessed considerable international efforts in developing and supporting nuclear security education. However, Arab countries continue to face certain obstacles in the development and implementation of nuclear security education programs. By providing an overview of the nuclear security program at Naif Arab University for Security Science, this study highlights the hurdles faced by Arab countries in implementing new academic programs and improving the quality of current programs in nuclear security. It also discusses the state of the art in nuclear security education and highlights important issues related to such education in the Arab world. However, the influence of nuclear security educational programs in Arab countries was not considered because it requires a separate, detailed analysis.

**Keywords:** Nuclear security, academic programs in nuclear security, women in nuclear security

## 1. Introduction

Several organizations and professional groups encourage governments to invest in nuclear energy programs because such affiliations provide various economic and environmental benefits. However, harnessing nuclear energy requires a well-qualified and educated cadre that can develop strict security policies to avoid human and environmental disasters.

Although academic programs in nuclear security, as a specialized scientific field, are still in their infancy [1], numerous regulatory, scientific, and national efforts over the past years have reasonably strengthened the idea of nuclear security and international adherence to nuclear security guidelines. For example, the International Nuclear Security Education Network was established in 2010 to provide instructional material on the broad field of nuclear security education and to encourage collaboration between educational and research institutions across the world. That same year, substantial progress was achieved when the Centers of Excellence were recognized as an essential component in the development of human factors in nuclear security. Two years later, the IAEA established the Nuclear Security Training and Support Center Network, marking another critical development in training. Despite the many significant achievements of these initiatives, a realistic blueprint for the formal establishment of quality nuclear security programs at educational institutions has yet to be developed [2]. Creating this blueprint would require studying and evaluating current nuclear security education and training programs in various countries. For this reason, several studies have addressed relevant issues in the United States [3, 4], Nigeria [5], and Pakistan [6]. However, such issues in the context of Arab countries have not been examined.

In Arab countries, the Naif Arab University for Security Sciences (NAUSS) offers a higher diploma academic program in nuclear security [7], and a single-semester program in nuclear security is provided by Khalifa University in the United Arab Emirates [4]. The lack of other programs, despite the increasing demand, suggests the existence of obstacles in developing new educational programs in nuclear security. In this context, one must have knowledge of the actual improvements required in the field—through surveys or other studies—that could clarify the possible challenges and indicate ways of overcoming them. This study elucidates the challenges faced by Arab countries in developing nuclear security education, with a brief overview of the nuclear security program at NAUSS. It also highlights related issues. However, the effect of nuclear security educational programs in Arab countries was not considered because it requires a separate, detailed analysis.

## **2. Naif Arab University for Security Sciences**

NAUSS strives to strengthen security and safety, highlight difficulties and threats, and build competency among the security cadre in the Arab world through education, scientific research, and training. The origins of the establishment of NAUSS can be traced to the Arab Security Conference held in the United Arab Emirates in 1972, where demands were raised to create an Arab center for investigation and research in the field of security. In 1978, NAUSS was established as The Arab Training Institute and later renamed The Arab Center for Social Defense Studies. It was renamed The Arab Center for Security Studies and Training in 1980. Five years later, the university headquarters were officially established in the Saudi capital of Riyadh. In 2004, the Council of Arab Interior Ministers decided to further change the name to Naif Arab University for Security Sciences [7, 8].

Recent efforts by NAUSS demonstrate excellent consideration for nuclear security and the prevention of nuclear weapons proliferation; the university's scholars have produced

several theses and dissertations on various nuclear security topics. Additionally, the university has actively organized conferences, workshops, and other activities in the last 2 decades. For instance, in 2006, it collaborated with King Abdul-Aziz City for Science and Technology to conduct nuclear security training and qualification programs. IAEA's head of nuclear safety and security supported these vital activities in a speech at NAUSS's 2009 international conference. The speech was on the importance of nuclear security and the role of knowledge and education in promoting and building a qualified cadre. Over the following few years, NAUSS staff were heavily involved in international conferences on nuclear security and nuclear security education, such as many conferences attended with nuclear security education networks. Furthermore, NAUSS collaborated with the IAEA in 2017 to implement nuclear counterterrorism training programs, with more than 80 specialists from numerous Arab countries participating [9].

The 1-year nuclear security program at NAUSS serves the medical, military, and industrial sectors by preparing—through critical thinking and discussion—skilled specialists to support nuclear security at the national level. The program also supports the Arab cadre in developing a nuclear security system that can effectively prevent and detect unauthorized access to physical facilities [7].

As presented in Table 1 [10], the curriculum of the current higher-diploma program at NAUSS provides students with a fundamental understanding of nuclear security. However, the critical question is whether the educational materials and teaching methods are adequate in helping students conduct scientific research and other investigations. This question stems from the lack of Arabic reference materials, which poses a significant challenge to students.

**Table 1. Course details**

Semester	Course title	Credit hours
First	Security, Safety, and Nuclear Safeguards Introduction to Nuclear Security International and National Nuclear Security Legislation Safety and Radiation Protection Assessment of Nuclear Threats The Origins of Scientific Research	2 per course
Second	Introduction to Nuclear and Radiological Emergencies Physical Protection Systems Security in Transporting Nuclear and Radioactive Materials Internal Nuclear Threats Forensic Analysis at a Nuclear Crime Scene Nuclear Criminal Acts and Methods of Detection	
	Total hours	24

The course details make it clear that the program relies little on task-oriented training, illustrating the need to include training courses in such programs. To this end, training objectives and strategies must first be clarified, and training material that would accurately represent the current challenges and issues in nuclear security should be developed and validated. In this context, a preprocessing step must be considered in the program's structure, which, in its present state, comprises two semesters that focus

on strengthening students' awareness of nuclear security at large, including its social intricacies, discourses, and cultural milieu. Thus, there is a need to develop the program and ensure its continued growth and capacity for modification. Because of the difficulties of including sufficient training courses and the time constraints that prevent administrators from completely revamping the curriculum, we first suggest modifying the existing program courses. Accordingly, developers must identify key components of an exemplary program structure that cover different educational aspects, such as training, research, and workshops.

### **3. Major Hurdles in Developing Nuclear Security Education in Arab Countries**

A successful academic program in nuclear security must develop standalone courses, redesign old ones, stimulate scientific research, and improve and evaluate teaching methods for a long-term, successful nuclear security educational program. Thus, studying and evaluating reliable and tested teaching methods is important to enhance our understanding of the framework of successful nuclear security academic programs.

One of the most difficult tasks is defining the major hurdles obstructing the spread of nuclear security education in Arab countries given that existing literature has not evaluated these challenges. However, it is quite clear by now that the challenges faced by Arab countries result from difficulties in securing qualified human resources in nuclear security, insufficient partnerships between scientific research and business sectors, and certain administrative (bureaucratic) constraints. Additionally, language barriers are a major hurdle faced by Arabs in nuclear security.

To elucidate these challenges, we first should look at the global shortage of specialized competencies in nuclear security, which has been discussed previously [11, 12]. This issue could be solved through collaborative assignments between scholars from different Arab countries, especially because most Arab countries do not have the individual economic capacity or scientific competence to implement academic programs in nuclear security. In this regard, if we take a general view of the contemporary educational sector, it seems that modern teaching methods depend primarily on communication among the participants. This in turn reinforces various opportunities for effective collaboration.

Moreover, the potential to develop new academic programs is severely hampered by procedural restraints in higher education institutions. Although no study has officially investigated how bureaucracy influences the implementation of new nuclear security programs, experience reveals a multiyear delay. Temporary academic programs have the potential to overcome these issues because university administration need only approve them for short periods, thus circumventing many procedures associated with long-term programs. Temporary programs also have several advantages that exceed those of permanent education academic programs, such as overcoming adversity and investigating and addressing weaknesses.

Additionally, solutions should be found for a number of other issues, such as the following:

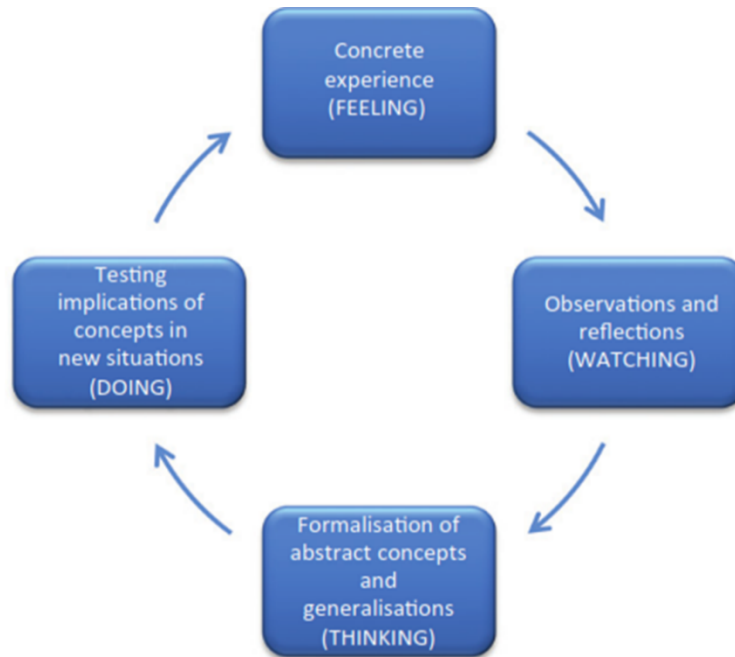
1. Arabic language–specific scientific references are scarce in the field of nuclear security. In this case, translating important books and publications on nuclear security and other radioactive material could be the best solution at this time.
2. The expansion of privatization and a market-based approach to education in Arab countries seems to be one of the major factors limiting support for nuclear security education programs, especially considering the poor state of some of these countries' economies.
3. It is also important to support the development of teaching faculty in nuclear security programs. The educational sector shows that the quality of academic programs relies on well-qualified faculty. Programs designed to improve faculty are extremely diverse in terms of structure and content. We suggest a specific model that targets three main development issues:
  - Professional development to effectively advance nuclear security education and make a significant improvement by supporting new scholars
  - Instructional development to directly improve faculty performance in classrooms through internal and external consultations, advisories, and workshops
  - Organizational development to develop successful academic programs, well-defined organizational policies, and efficient procedures that motivate and reward continuous professional development

These developments are essential for fostering faculty members' ability to perform at their highest levels.

#### **4. Effective Models for Nuclear Security Education**

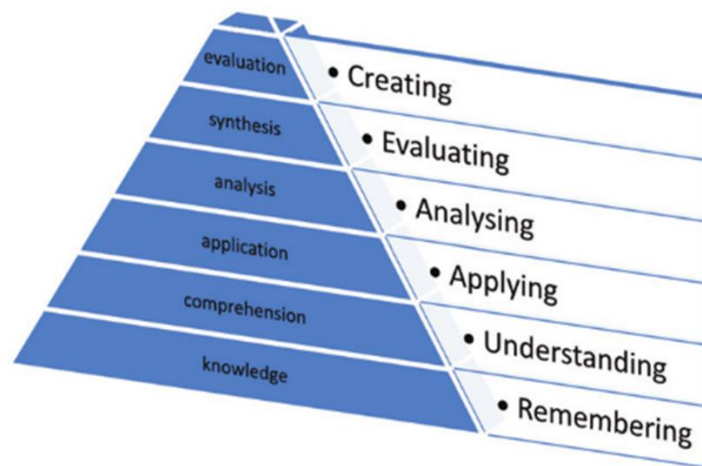
Considerable international efforts have occurred for the development and support of nuclear security education. Thus, identifying areas of strength in existing programs is necessary to continue bolstering and furthering these qualities. Nuclear security education relies on adult education, and it is important to understand and augment adult-learning theories and appreciate their utility in the context of nuclear security education and training.

1. **Experiential learning:** As confirmed by Kolb in 1984 [13, 14], this type of learning is the most common and effective way of learning among adults. In fact, it is used in everyday life, as explained in Figure 1. Experiential learning occurs in cycles, starting with concrete experience, followed by reflection, conceptualization, and the application of what has been learned as default.



**Figure 1: The Kolb Cycle.**

2. Bloom's Taxonomy: This taxonomy of educational objectives and adult learning [15, 16] would help clarify the basic and advanced levels of nuclear security knowledge and its application. Because simply recalling information on nuclear security is not beneficial to practitioners, practical use of the information would be considered a higher level of education and training. Accordingly, a more hands-on application of nuclear security knowledge is required, as explained in Figure 2.



**Figure 2: Bloom's Taxonomy, after Atherton.**

3. Miller's Pyramid: This pyramid would help practitioners consider the direct application of nuclear security knowledge as the basis for dealing with nuclear material and radioactive sources. Their actions and behaviors are considered a

build-up of knowledge, which advances its use from simple recall to application (Figure 3).

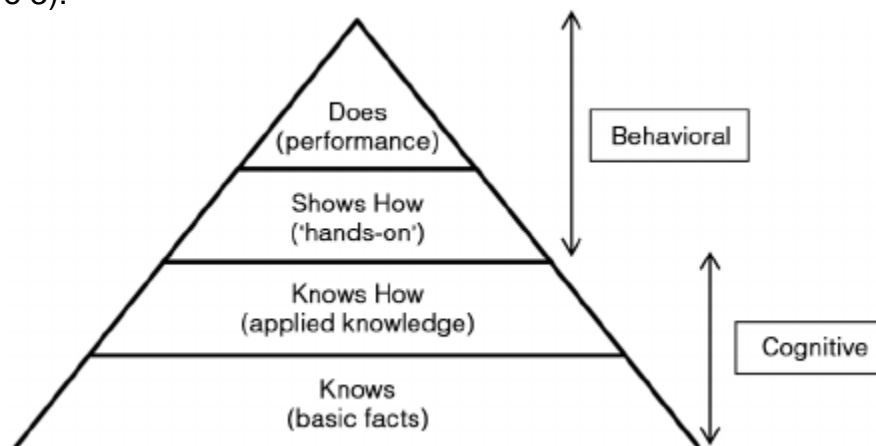


Figure 3: Miller's Pyramid [17, 18].

## 5. Issues for Further Consideration

### a. Arabic Women in Nuclear Security

Women have been historically ignored in leadership roles in the nuclear field, essentially because of lack of institutional support. In 1992, Women in Nuclear Global (WiN Global) was established as a world organization that provides various assistance across a vast range of nuclear industries [19]. Recent years have resulted in significant strides for women in the nuclear field. For example, in 2021, Rose Gottemoeller from the United States became the first woman to lead nuclear arms reduction negotiations [20]. She endured significant struggles throughout her career, and she managed exceptional progress as a leader who could decrease nuclear threats to Russia, Ukraine, and Eurasia [20]. Furthermore, in a global effort to strengthen women's participation in nuclear security and showcase their experiences and successes, the IAEA's Division of Nuclear Security founded the Women in Nuclear Security Initiative (WINSI) in March 2021 [21].

However, in Arab countries, insufficient attention has been paid to the challenges faced by Arab women in the nuclear field. Moreover, little effort has been made to support women who wish to engage in nuclear education and research. This issue highlights the need to allocate grants and provide real opportunities to Arab women through the NAUSS program, thereby supporting them from an educational standpoint. These opportunities could be provided by the following:

- Studying their unique challenges with an eye toward actionable solutions
- Developing clear plans to solve these challenges
- Implementing and evaluating these plans

### b. Arab Nuclear Security Education Network

Nuclear security education networks are commonly perceived as providing significant support to governments and practitioners. However, cooperation between governments, organizations, and nuclear experts is conspicuously absent in Arab states. The establishment of an Arab nuclear security education network is a priority for executing



many initiatives as the center begins engaging in developing nuclear security education programs.

A critical metric for the success of an Arab nuclear security education network would be raising awareness on nuclear security issues, supporting scientific research, motivating experts to participate in the educational process, providing educational resources to multidisciplinary groups, and validating the methodology and its results. To this end, nuclear security education networks should evolve continuously to fulfill the target audience's needs; this evolution could be accomplished by engaging in strategic alliances for developing new knowledge, capabilities, and methods [11].

## **6. Conclusion**

A successful nuclear security education program requires the implementation of new and unique courses alongside efforts to stimulate research. Meanwhile, old or outdated courses must be redesigned. Moreover, continued research is needed to determine which methods are best for increasing efficiency, primarily through critical examination of specific outcomes; in turn, such efforts would clarify the necessary framework for selecting appropriate methods. Even more critical is the development and evaluation of innovative instructional methods. If these methods can be empirically validated, we could also chart observable success at educational institutions that teach nuclear security.

This study provides evidence of insufficient development in education programs on nuclear security in Arab countries because of several challenges. Some additional issues of concern include the lack of support for Arab women in the nuclear field and the need to establish an Arab nuclear security education network.

We believe that the higher-diploma program at NAUSS can serve as a model education program to help Arab countries make nuclear security improvements. However, solutions for issues in implementing these improvements are still required. The first essential requirement is enhancing the Arabic library by ensuring that scientific references are available in Arabic. Important books on nuclear security and other radioactive material must be translated into Arabic. The second requirement is collaborative assignments between scientists from different Arab countries; in this regard, distance education could compensate for the lack of specialized competencies in the field, especially because most Arab countries do not have the direct economic capacity or scientific competence for implementing academic programs in nuclear security. The third requirement is for academic programs on nuclear security to not only comprise diploma, master's, and doctoral programs but also various short courses, summer school programs, and other initiatives. Nuclear security education programs in Arab countries should meet these challenges, overcome barriers, and support innovation. This would lead to improvements in education, job creation, and research funding.

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