



**EUROPEAN ACADEMY OF SCIENCES**  
IN SUPPORT OF EXCELLENCE IN SCIENCE AND TECHNOLOGY

**Galvanizing Science Education for Fostering an Innovation Culture in the Arab Region**  
*Comments of EURASC experts, whose qualities are listed at the end of the document.*

**Preamble:**

The initiatives proposed in the *Arab Strategy for Science, Technology and Innovation* (hereafter, “the Strategy”) adopted by the Council of Ministers of Higher Education and Scientific Research in the Arab World in 2014 will undoubtedly play a major role in determining positive change, specifically combating poverty and promoting sustainability. The objectives described in the Strategy are however very ambitious and due to the challenges that lie ahead, will take a long time to be attained; in fact, several of the proposed aims have not even been achieved in present day’s Europe, largely considered as the world’s continent with the highest quality of life. In this sense, the Strategy presents an opportunity for the Arab World and the European Union to work together towards common goals.

However, for significant long term change to occur, there needs to be a combined political and social willingness to embrace a new paradigm. This requires broader and bolder thinking and the moral courage to act and even take risks.

The recent, ongoing mass exodus of refugees from the Middle East (mostly Syria) and North Africa all across Europe has highlighted the flaws of our modern civilization, as well as the major divide in terms of willingness to help populations that are in dire need. While European countries have reacted very differently, going all the way from “we accept all refugees” to “we will not accept any”, Arab countries (consistently all the countries in the Arabian Peninsula) have refused any humanitarian help. This crisis is a strong indication that now more than ever there is a need for visionary thinking and leadership, towards peace and sustainability.

*At a macro-level, we wish to get experts opinion on:*

**A. The cause and effect analysis of the situation and similar experiences and best practices addressing the identified four drivers of change;**

The primary concern for any society to promote its long term sustainable development should be to promote education, at all levels, starting from elementary school to promote curiosity among children (of both genders). Quoting Nelson Mandela, “*Education is the most powerful weapon we can use to change the world*”.

The first step in this direction is therefore to create a national program to improve education for children. Science education is a fundamental component of a general education program; it should be carried out following modern approaches that start from every day concrete facts and hands-on experience to foster curiosity and stimulate children to ask questions and learn from mistakes. However, at a higher level science education should be reserved to a small number of highly motivated and talented students; perhaps 5% of the total could be selected through nationwide competitions (similar to those implemented in India), leading to scholarships to study in the best universities in an Arab country or elsewhere.

A preliminary action to improve primary and secondary school education would be to create a group of suitably trained Arab teachers; this could be done by sending European teachers to Arab countries for short courses aimed at educating the future Arab teachers. Alternatively, cohorts of Arab teachers could be trained in Europe. Such exchanges would be mutually beneficial also for the intrinsic value related to international understanding and mutual cultural appreciation. This initial step would therefore also involve promoting peaceful and coexistence values and principles such as tolerance, respect of others opinions and personal and religious freedom.

Several developing countries have faced similar challenges in the last half century; notable examples include Brazil, India, Israel and South Korea. In India, the two key factors that prompted the establishment of a major software and IT industry were the quality of the educational system and the growing number of students attending universities in the USA and who were then willing and able to come back. Brazil and Israel represent major success stories, which however are mitigated by the access to natural resources in the case of Brazil and economic aid from the USA in the case of Israel. The most incredible success story is the one of South Korea. In ruins after the separation from the North, in the early 60's South Korea was one of the poorest countries in the world. The political leadership of the time then decided to invest in the country's only resource: its people. This prompted major investments in education, which led to the technological giant that the country is today. Of course the situation of South Korea is a stark contrast with respect to Arab countries, which largely rely on their availability of natural resources. Nevertheless, in the long term a country's people are its only and best resource and educating the population is the most sensible investment towards peace and a sustainable future.

Renewed efforts in education should be mirrored by investments in research, both fundamental and applied. Innovation is driven by need, however it is fostered by curiosity, which means that applied and basic research must coexist for best output.

Innovation is, by necessity, a by-product of university education and research. Research is about turning money into new knowledge; innovation is about turning knowledge into money and is usually done in the private sector.

The next logical step towards innovation would then be to establish technological colleges, or even "higher end" Institutes of Technology, so as to promote the talents of students who are interested in developing practical solutions to real problems as well as aspiring entrepreneurs.

In parallel, it is advisable to establish well organized technology parks as a converging nexus for colleges, universities, technical universities and industry. Such parks can play an important role to enhance technological output as well as stimulate the cultivation of industrial entrepreneurship.

The last step, which is perhaps more ambitious, involves training first class business and political leaders. A major related challenge is to promote democratic values, which would allow such new leadership to emerge.

**B. What possible solutions from within the region (national or regional in nature) could trigger the required transformative change;**

Education and research are the only true pathways towards the long term development of any nation or region. It is therefore crucial to instill the notion that such endeavours are important and should be rewarded by society.

Pooling material and intellectual resources would be an effective strategy towards transformation and development. In a first step, the countries involved should establish regional centres of excellence which host major scientific equipment and which act as training and service facilities both for universities and for the private sector. In parallel, the Strategy should promote exchanges of students and professors, stimulate and fund joint research projects and recognize courses and diplomas so as to facilitate student mobility. Such actions have proven to be extremely beneficial in Europe in the last half century; in the current scenario, they would foster the creation of a strong regional collaborative network, which is a pre requisite for effective international collaboration.

Finally, the private sector must come into play. The word ‘industry’ appears only once in the whole document (Interface between Government and Industry). Therefore at this stage it is more appropriate to think in terms of industrialization rather than commercialization; this step cannot be skipped. To this end, Academia, Industry and Government should work together in very close collaboration; all three should participate in elaborating the final document, particularly for planning and implementing key actions.

**C. What Global Support Mechanisms (particularly from the EU side) could be used for Science and Engineering Education improvement towards an innovation and Techno-preneurship Culture?**

The education standards in Arab countries are presently quite low. This poses a serious challenge, since a high level of general education is the foundation for any development, both educational and societal. In this sense we refer to part of our reply to question A above, namely create a core group of suitably trained Arab teachers that would be tasked to raise current education standards.

As suggested above, the EU could help towards this end through exchange programs that would train this new generation of teachers and educators. Such efforts could be jointly funded by Arab countries and the EU, as they would be mutually beneficial.

Finally, the Arab countries could launch major entrepreneurship challenges, similar to the X-Prize (<http://www.xprize.org/>; *An XPRIZE is a highly leveraged, incentivized prize competition that pushes the limits of what’s possible to change the world for the better. It captures the world’s imagination and inspires others to reach for similar goals, spurring innovation and accelerating the rate of positive change*), designed to stimulate innovation. While such initiatives present major risks (recall the historical landing of man on the moon), the rewards, in the form of by-product technologies that are developed, would be enormous.

**D. Are there any specific initiatives for galvanizing science and engineering education and the possible supporting mechanisms for these initiatives?**

Historically, the Arab region has contributed vast knowledge to humanity, particularly in mathematics and general science. It is important to exploit this historical perspective to renew the general population's interest in science and technology, building on a sense of pride arising from the Arab scientific tradition and legacy.

Dedicated science shows and festivals for young students could be used to nurture interest in science and technology. Such shows should be geared towards encouraging enrolment in science and engineering curricula in universities.

Within existing curricula, activities and policies of open innovation and crowd sourcing should be launched to encourage young talents and to create a suitable environment for innovation.

### *At the micro-level:*

#### **1. What role does innovation play? And which types of innovation have priority in implementation;**

Innovation plays a major role towards societal development. Its impact and necessity cannot be overstated. Historically, in recent times innovation has spurred the development of the BRICS countries as well as, previously, Hong Kong, Singapore, South Korea and Taiwan.

Priority should be given to innovation opportunities that target topics which are essential to the needs of the region, such as e.g. renewable energy technologies, fresh water and agriculture under extreme weather conditions. Such prospects are effectively tackled through multidisciplinary approaches which are based on the integration of science and engineering.

Because of the abundant sunshine in the region, the development of solar energy technologies should be considered a priority. In parallel, since energy storage is the grand challenge of all renewable energy technologies, major research efforts on this topic should be deployed. Technologies developed through these efforts can be exported and commercialized worldwide.

#### **2. What type of programs the EU could devise to assist the Arab region governments in achieving their goals while setting up for a more effective partnership that would yield the science collaboration levels the EU seeks?**

The European Union can play a major role in assisting the Arab region, by opening its laboratories and university environments to students and researchers from Arab countries, who would come for short, medium or long term visiting stints to learn research practices and methodologies and then bring them back to their country of origin. This would require a dual investment, on one hand from the Arab countries to fund the exchange scholarships (similar to the ones created in Brazil, "science without borders"), also creating the right conditions to return; and from the EU, to fund suitable training programs as well as the infrastructure and live costs of research (operating funds).

In parallel, the EU and Arab countries should establish and jointly fund an "East-West" University, based in Istanbul (crossroads between Europe and the Middle East), to jointly train a new generation of diplomats, social entrepreneurs and political leaders who are sensitive to cultural differences. This

training should also include empathy (i.e., *the capacity to understand or feel what another person is experiencing from within the other person's frame of reference, i.e., the capacity to place oneself in another's shoes*). The recent refugee crisis is a strong indication that both Europeans and Arabs have a lot to learn in the arena of empathic action.

This “East-West” University could follow, for example, the high school model called “United World Colleges” ([www.uwc.org](http://www.uwc.org)): United World Colleges make education a force to unite people, nations and cultures for peace and a sustainable future. The proposed initiative would involve creating a similar concept at the undergraduate and possibly graduate level, placing emphasis on international and intercultural understanding as well as sustainability.

In a second step, Arab countries could create a network of engineering schools that educate at the highest level in engineering and promote a culture of innovation and entrepreneurship. Two networks are proposed:

- a) Mediterranean Institutes of Technology, built across northern Africa all the way to Turkey, across Jordan, Lebanon, Syria and Turkey; and
- b) Arab Institutes of Technology, built across the Arabian Peninsula and Iraq.

These institutes would follow the model of similar successful institutions in the west, so as to develop internationally competitive curricula and advanced research programs.

In a third step, Arab countries should launch a joint entrepreneurship fund (see discussion above on the X Prize in the response to C), which focuses on grand challenges for society, with emphasis on renewable energy, environment and health. This fund should help to establish start-up companies and help to bring back expatriates who were successful abroad and who want to come back to the Arab region.

The aim of all such initiatives is consistently to build capacity; not only in the areas of science and technology but also in other areas of importance for societal development.

**3. In the context of the identified issues as per the attached article, are there any particular or specific program(s) currently functioning that could be used to bring the necessary change in the Arab region towards an innovation economy.**

See responses to C above (the X Prize), to 1 (solar energy and energy storage) and 2 (student and faculty exchanges; “East-West University”; Mediterranean Institutes of Technology; Arab Institutes of Technology). In addition, there should be an effort to develop technologies for waste recycling.