



A New Initiative to Improve the Energy Education at the Secondary and Technical Schools in the Arab World

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Abstract

An initiative to improve the teaching of science, especially of energy related subjects (renewable- and nuclear energy) at the secondary and technical schools in the Arab World has been started. The first program of this initiative is based on establishing cooperation between Arab and European institutions for continuous training across the Arab world. The second program is based on establishing an Arab-European platform for the direct contact between the leaders of the scientific communities, foundations, organization, education authorities and teachers, to discuss all together the possible cooperation programs which are suitable to support science/energy education. The third program is based on promoting the energy literacy education efforts by supporting the social activities between teachers/students and the surrounding communities, using outreach programs, social media and multimedia tools. The fourth program contains the promotion of the teachers and authorities to improve the curricula; in order to include energy related subjects, considering significant practical skills. The financial support of OFID made it possible to start this program and to realize the first two activities in October 2015. The first activity was the organization of the Arab-European Summer School on Energy Education (AESSEE), which will be organized annually. The aim of the AESSEE is to improve the knowledge and the practical skills of teachers by providing them with updated information and scientific developments, through direct contacts with international experts. AESSEE-2015 was organized at TU-Vienna (October 19-31, 2015) with 20 participants from 8 Arab countries (Algeria, Egypt, Jordan, Lebanon, Libya, Oman, Saudi Arabia, and Tunisia). The scientific program included lectures, discussions, excursions and experiments, in collaboration with 19 scientists representing 13 European institutes and international organizations. The second activity was the organization of the Arab-European Forum on Energy Education (AEFEE) on October 30, 2015, which took place with the support and the participation of international organizations such as OFID, IAEA, Arab League and EUREC. The forum offered the opportunity to discuss the problems and the suggestions for cooperation with the participants of AESSEE. The scientific programs of the two events will be discussed in details.

Introduction

Three main factors are affecting the quality of the educational systems across the Arab world. These factors are the large discrepancy regarding the economic situation of the Arab countries, the demographic factor and the political-social conditions. The economic situations of some countries which are mainly depending on resources such as oil demonstrate this discrepancy, whereupon precisely this economic situation simply influences the quality of education programs and accordingly the labour markets [1]. The proportion of the population of the rich Gulf countries is only about 16% of the total Arab population of 385 million (2014). Therefore, it can be assumed that the education systems of 84% of the Arab population are in general suffering from several economic and social problems. Since the 90s of the last century, most of the countries of the Arab world have started several programs to improve the education systems through significant investments in infrastructures, furthermore by developing curriculums focusing on science and mathematics or training programs for the teachers. However, these efforts were carried out within the available financial capabilities and the political situations [2-3]. It was clearly evident that teachers are the most important key in solving these problems. Therefore this initiative is very important as a right signal at the right time.

The paradox of the situation considering the energy crisis in the Arab world is that all of the Arab countries are mainly depending on oil and gas as sources of energy (85-95%). However, due to the world economic situation as well as the reserves of these resources, the GCC and others have started new programs including huge investments to change the strategy of energy in that area [4-5]. Renewable and nuclear energy programs at the GCC and the rest of the Arab countries are gaining significant interest, however, up to now the education systems across the Arab world are not prepared for this great challenge. Energy education for the Arab speaking countries could be the ideal subject to

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bridge the gap between education and the job markets now and in the future which could be very attractive for technical schools and also would influence the market positively. Therefore, it was important to start this initiative and to organize the Arab-European Summer School on Energy Education (AESSEE) for secondary school teachers of the Arab world as the first step. Additionally, it also was necessary to start the second program by organizing the Arab European Forum on Energy Education as a platform for cooperation to improve the education at the Arab region.

Methodology

The selection procedure for teachers to attend the first AESSEE-2015 with a financial support was based on writing a summary of a proposal (300-400 words) entitled "school based initiative to improve the renewable energy and energy efficiency culture". We succeeded in selecting 20 candidates from Algeria (3), Egypt (5), Jordan (3), Lebanon (1), Libya (2), Oman (3), Saudi Arabian (1) and Tunisia (2). The main efforts were focusing on providing an excellent scientific program by engaging high standard scientists and institutions, in order to cover topically most subjects of energy and the related technologies. Therefore, 18 speakers representing 13 scientific institutions took part and that opened the opportunity for the participants to a wide range of contacts and further cooperation in several fields. The following organizations and institutions were involved: IAEA, CTBTO, CNR-ITAE (ITALY), CNRS-PROMES (FRANCE), ITW (Stuttgart), University of Natural Resources and Life Sciences (Vienna), Montanuniversität (Leoben), TU-Wien (e.g. Institute of Applied Physics-IAP, Institute of Energy Systems and Electrical Drives, Atominstitut), Austrian Institute of Technology, Verbund-Austria and BMFLMW. Additionally, the scientific program involved 5 scientific visits including lectures about the activities and the structures of the visited centres. The first forum was organized on the last day of AESSEE-2015. It served as a possibility to provide direct contact to the most important scientists and organizations for the participants of AESSEE. The first part of the scientific program included several talks and presentations of several international and national organizations such as OFID, IAEA, EURC, Atominstitut and TU-Wien. The second part consisted of presentations to demonstrate the capabilities and the experience of the most important nuclear institutions in Austria such as Atominstitut, MedAustron and Vienna Environmental Research Accelerator (VERA) centre of the Vienna University. The third part was a panel discussion providing the opportunity to the participants to discuss directly with the scientific leaders the possible cooperation and support. The feedbacks of the speakers were collected in order to serve as a basis for further activities. Finally, three months after this event the participants were asked to send a report on their activities at their schools and societies.

Result and Discussion

After the evaluation of 44 provided summaries of proposals (selected and non-selected candidates) it was obvious that only 66 % of the candidates were in the position to meet the requirement to provide a summary of 300 words or more. Some of them sent an abstract of 50 to 70 words only. The aim of the requirement of this summary was to verify the English language skills, the activities at the schools or universities related to the culture of renewable energy, the possible social engagements and the knowledge about the country specific energy information of the candidates. After the analysis of three main indicators, namely, school based activities or ideas, country specific information and proposals for general projects or actions, it turned out that 23 % of the candidates had provided country specific information such as renewable energy installations, the profile of energy demand, or information regarding the education system, while 67% of the candidates mentioned general and broad suggestions regarding the implementation of renewable energy in general or at their countries.

The most critical result was obtained from the ideas for school based projects, as only 10% had provided just general suggestions to improve the interest in renewable energy at schools. These results actually reflect the real situation, as it was very difficult to select 20 candidates from all the Arab countries due to the lack of support of our efforts by most of the authorities of the Arab countries. The League of the Arab States (LAS) was invited to assist in selecting the teachers by sending the necessary information regarding the participation and the task of selecting candidates for AESSEE to all the Arab states through the official channels. However, it was only possible to receive replies from 5 of the 22 countries. We succeeded in adding candidates from three countries through direct contacts. After an intensive work, using social media and writing several letters to education and teacher organizations, it still was not possible to obtain candidates from the other counties.

The evaluation of the first questionnaire, after one week of training in the field of renewable energy, clearly showed a significant result. Whereas 95 % of the participants indicated that the management



and the scientific program were excellent, the main point of criticism concerned the intensive working program (7 hours daily). The most interesting subject for all of the participants was solar energy with the practical application and demonstrations. In general, the ideal training program for the teachers is characterized by less information, at the same time more discussion and demonstration.

In the first questionnaire, all participants have suggested the following statements to improve the culture of energy in the Arab world: intensive school activities with the students, preparation of interesting materials such as flyers for students, motivating other teachers for establishing activities including experiments, modification of the curricula in order to include energy related materials, continuous training and meetings for teachers who are interested in the subject, activities via social media and the internet, preparation of an official structure for the participants of the AESSEE, pressure on the public media (newspapers and TV) to the effect that they show more interest as a main source of information in such societies where illiteracy is an issue (54 million in 2015). Those suggestions had been completely absent in their provided proposals, and the most important point is the call to work together in an organized form. Certainly all these items belong to the usual activities at the level of international school programs for many years, but AESSEE shows that the change in the Arab world could also take place fast, if the proper programs were organized. The question was: What led to such rapid changes in the responses of the participants, compared with their proposals?

After the individual interviews, the answer was very clear, as the participants indicated that after the first week of training their knowledge regarding energy had increased to at least 3 to 5 times, 25 % of them mentioned that their knowledge had improved 6 to 8 times in comparison to their information before the training program. This is actually true, as in general the field of energy related subjects is absent in the curricula and information during their studies or teaching. AESSEE-2015 had provided a broad scale of information about the most important energy sources; therefore the response of the teachers was very fast due to their experience and their scientific background. Motivation is the key to change the Arab countries with simple resources.

Due to the new nuclear programs in this region (UAE, Saudi Arabia, Jordan, Egypt, etc.) it was necessary to include nuclear education in the program of AESSEE and to invite IAEA and CTBTO to demonstrate their activities, facilities, roles and to open the doors for them to visit the most two important centers at the two organizations. The second week was organized in order to provide broad and general information about nuclear science and related technologies. The program included subjects such as nuclear power plants, nuclear accidents, radiation protection, nuclear treaties and non-proliferation, nuclear medicine, fusion energy, international and national radiation monitoring systems, nuclear research reactors. This information represented a completely new field for all of them with very positive feedback.

Conclusions

AESSEE is an important program for the teachers of Arab countries, but it would be necessary to organize it for a period of 3 to 4 weeks in order to being able to extend the scientific program for more practical exercises.

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