

## Chapter 24

# IT-Based Education With Online Labs in the MENA Region: Profiling the Research Community

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### ABSTRACT

*Education plays a primary role in developing countries, fostering their economy and augmenting their human potential. It is now easier to learn newest methods and techniques in many fields, particularly in engineering and science, where IT-based educational tools - such as online laboratories - have been instrumental to improve the teaching and learning process. Online laboratories are widely used in several universities around the world, particularly in developed countries. There is evidence that online laboratories have a positive effect on the students' skills and promote cooperative and collaborative learning by allowing them to work remotely without restrictions. This led to a quality increase of the teaching and learning process. Likewise, students from other countries, namely in the Middle East and North Africa (MENA) region, could also benefit from using online labs. This paper studies the existing collaboration among the researchers working with online labs, in the MENA region, by reviewing a selection of articles from conferences and journals. The patterns of cooperation and collaboration among them are discussed and analyzed, as well. In the authors' opinions, the community characterized in this paper should establish more collaboration links in order to strength its capacity of influencing the adoption of online labs, in that region.*

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## 1. INTRODUCTION

Most of the 18 countries in the MENA region share many characteristics: language, culture, education systems, community service, etc. (Salah, Alves & Guerreiro, 2014; Humos, Alhalabi, Hamzal, Shufro & Awada, 2005). More specifically, students of engineering and science in the MENA countries share the demand of more lab experimentation in their programs of study. It is to their countries advantage to heed to this demand. Indeed, practical experiments are considered the backbone of serious studies in engineering or applied sciences, as they enable a more thorough understanding of the scientific concepts and theories.

Recently, distance education modality has helped overcome some of the difficulties faced by technological education, namely the scarcity of well-equipped laboratories and it has become a viable option for many students worldwide. Using several forms of distance education, students can easily access a wider variety of resources, and can share their own work with other, without geographical limitations (Humos *et al.*, 2005; Ferzli & Karam, 2006; Egoeze, Misra, Akman & Colomo-Palacios, 2014). Moreover, some systems include features such as chatting, video conference, and online laboratories, that available at any time.

E-learning systems have been continuously evolving toward better supporting and stimulating teachers and students in sharing resources (Garcia-Penalvo, Conde, Alier & Colomo-Palacios, 2014), doing synchronous communication, and scaffolding learning activities (Peytcheva-Forsyth & Yovkova, 2015).

Many online laboratories have become available in the last few years for engineering and sciences, namely, VISIR, iLabs, LabShare, and others. Using these laboratories has become one of the alternatives for students, when experimental work is required especially given that traditional laboratories do not abound. Furthermore, the safety and availability issues are also much less stringent when using remote laboratories.

A significant number of researchers from MENA countries have published papers in the general field of Remote Virtual Labs. There are papers addressing technical issues and papers that discuss the benefits and the drawbacks of this technology. Some papers also describe the types of cooperation between universities that RVLs have made possible.

All these aspects are relevant to the MENA countries, and they could help those countries tackle the growing numbers of students of engineering and sciences in their universities.

The present report analyses the activity of RVLs researchers from the MENA region, by means of the scientific papers they presented in international conferences and journals.

In our analysis, we classified the authors of those papers in two groups: one group includes authors based on one of the MENA countries; the other group includes the authors based outside of MENA region while being originally from one of the MENA countries.

Our main objective is to study the impact of RVLs on the MENA researchers and to highlight keys aspects that might help to develop and strengthen the higher education systems in this region.

The remainder of this paper is divided into six sections. Section II presents the related work and gives some background on remote labs. Section III discusses the evaluation and data collection methods that we used in this work. The core results are the subject of section IV. Section analyses those results. Section VI is the conclusion.

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