

## A Call to Redefine Undergraduate Medical Education: Fostering Scientific Research and Evidence driven Decision-Making among Future Physicians

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### STUDY DESCRIPTION

Exposing physicians to research experiences, early-on in their education trajectory, is associated with improved academic performance, and heightened research interest and productivity [1]. It is established that research training, as part of undergraduate medical education, fosters positive professional identities, among future physicians, and enriches their career paths [2,3]. In addition, the development of strong research skills, among healthcare practitioners, and the provision of quality medical care are proven to be intricately linked. It is believed that research constitutes the core of the practice of medicine and makes medical students better future clinicians [4,5]. It empowers the students to practice evidence-based medicine in their training and future practice [6,7].

Research training is internationally recognized to be a vital component of physician education [8-12]. Yet, integrating experiential research curricula in undergraduate medical programs remains uncommon. Accordingly, the purpose of this commentary is to shed light on an innovative research module that is integral to the undergraduate Bachelor of Medicine and Bachelor of Surgery (MBBS) program in the College of Medicine (CoM) at the Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU) in Dubai, United Arab Emirates [13-16].

The MBBS program at MBRU comprises of a six-year curriculum founded upon a competency-based learning model. The learning process, with integrated courses across the 12 semesters (i.e., each academic year is composed of 2 semesters), is spiral. The respective research module is mandatory for all enrolled undergraduate medical students, and consists of a series of five interconnected courses in epidemiology, biostatistics, and the scientific research methodology, delivered over the first five consecutive semesters of the MBBS program [16].

The mode of delivery of this research module is sequential where one course is delivered in each of the first 5-semesters, totaling eight Credit Hours (CH). Each course builds upon the knowledge and skills obtained in the preceding course. In that way, the acquired knowledge and skills are reinforced as the student progresses in the research module.

The first three courses, delivered in Semesters 1 through 3 (totaling 4 CH), offer the students a comprehensive background of the sciences of epidemiology and biostatistics, and of the basic technicalities of the scientific research methodology. As for the two courses delivered in Semesters 4 and 5 (totaling 4 CH), they are practical, and are designed to further reinforce the students' understanding of the principles of research design and methodology, where the students apply what they learn through undergoing their own research projects.

In fact, those latter two courses of the module are designed and implemented based on Situated Learning Theory (SLT), which is one of the holistic theories of experiential education. SLT emphasizes the learning that occurs through participation in the social world [17-19]. Throughout those two courses, each student performs their own research project with an assigned supervisor. A list of health-related research opportunities is prepared for the students to choose a project from. These projects are biomedical (clinical or lab-based) or socio-behavioural (related to public health or medical education). The supervisors' main responsibility is to support the students to pursue the respective research project. As such, the students are mentored, by the assigned supervisors, throughout the scientific research process in relation to the subject under investigation. In parallel, the students are required to attend a weekly standing session facilitated by the course team to discuss and collectively address any research-related queries.

This "common ground" assures maintaining the momentum of the course implementations, while the students are immersed in pursuing their own research projects. As such, the individual

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students evolve as they progress in the entailed learning experience, which takes place in the authentic context, among the respective community-of-practice.

To assess the efficacy of the intervention and develop a systemic understanding of the experiences of the undergraduate medical students throughout the respective mandatory research module, quantitative and qualitative datasets were collected and analyzed [20,21], and in turn systematically integrated [22,23]. The performance of the students as they progress throughout the research module was quantitatively analyzed [24]. Concurrently, the qualitative data collection component aimed at exploring the development of the perception of students in relation to the module [25-27].

Merging the results of the quantitative analysis with that of the qualitative introduced the evidence-driven 8A-Model. This framework suggests that the undergraduate medical students enrolled in this research module go through four specific steps to effectively integrate the scientific research method: Attend-Acquire, Accumulate-Assimilate, Apply-Appreciate, and Articulate-Affect. The students are first faced with the requirement of attending the sessions of the sequential courses. They then start acquiring and in turn accumulating the knowledge and skills. The students then begin assimilating the knowledge that they are acquiring, which fosters their critical thinking, enabling lifelong learning. This, in turn, enables them to start applying what they have been learning all along (through applying in the process of conducting their selected research projects). This empowers the students, solicits their appreciation, and encourages them to articulate their findings, which in turn affects the fields of medicine and/or public health, instilling constructive change and improvements.

The systemic analyses showed that the turning point in the introduced framework is at the “Apply” step. This indicates that didactic research teaching must be complemented with the provision of research opportunities where the students implement what they are learning, while getting counselled on the attitudes and mindsets needed for them to thrive in research environments. This is especially true when the experiential learning component of the research module is based on the SLT, and when the educators (throughout undergoing their nurturing responsibilities) do not restrict their perspective to the individual learner, but also consider the learner’s experiences and environments. As such, the experiential education, integral to this module, is optimized through the individual students’ embeddedness in the authentic context, among a community-of-practice. Accordingly, this commentary is a call for revisiting and redefining undergraduate medical education through integrating a mandatory research module, such as that embedded in the MBBS at MBRU, with a firm experiential component that is based on a holistic theory of education.

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