

The Dire State of Science in the Muslim World

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The Dire State of Science in the Muslim World

Universities and the scientific infrastructures in Muslim-majority countries need to undergo radical reforms if they want to avoid falling by the wayside in a world characterized by major scientific and technological innovations. This is the conclusion reached by Nidhal Guessoum and Athar Osama in their recent commentary [Institutions: Revive universities of the Muslim world](#) (1), published in the scientific journal *Nature*. The physics and astronomy professor Guessoum (American University of Sharjah, United Arab Emirates) and Osama, who is the founder of the Muslim World Science Initiative, use the commentary to summarize the key findings of the report [Science at Universities of the Muslim World](#) (PDF) (2) (3), which was released in October 2015 by a task force of policymakers, academic vice-chancellors, deans, professors, and science communicators. This report is one of the most comprehensive analyses of the state of scientific education and research in the 57 countries with a Muslim-majority population, which are members of the Organisation of Islamic Cooperation (OIC).

Here are some of the key findings:

1. Lower scientific productivity in the Muslim world: The 57 Muslim-majority countries constitute 25% of the world's population, yet they only generate 6% of the world's scientific publications and 1.6% of the world's patents.

2. Lower scientific impact of papers published in the OIC countries: Not only are Muslim-majority countries severely under-represented in terms of the numbers of publications, the papers that do get published are cited far less than the papers stemming from non-Muslim countries. One illustrative example is that of Iran and Switzerland. In the [2014 SCImago ranking of publications by country](#) (4), Iran was the highest-ranked Muslim-majority country with nearly 40,000 publications, just slightly ahead of Switzerland with 38,000 publications – even though *Iran's population of 77 million is nearly ten times larger than that of Switzerland*. However, the average Swiss publication was more than twice as likely to garner a citation by scientific colleagues than an Iranian publication, thus indicating that the actual scientific impact of research in Switzerland was far greater than that of Iran.

To correct for economic differences between countries that may account for the quality or impact of the scientific work, the analysis also compared selected OIC countries to matched non-Muslim countries with similar per capita Gross Domestic Product (GDP) values (PDF). (5) The per capita GDP in 2010 was \$10,136 for Turkey, \$8,754 for Malaysia, and only \$7,390 for South Africa. However, South Africa still outperformed both Turkey and Malaysia in terms of average citations per scientific paper in the years 2006 to 2015 (Turkey: 5.6; Malaysia: 5.0; South Africa: 9.7).

3. Muslim-majority countries make minimal investments in research and development: The world average for investing in research and development is roughly 1.8% of the GDP. Advanced developed countries invest up to 2 to 3% of their GDP, whereas the average for the OIC countries is only 0.5%, less than a third of the world average! One could perhaps understand why poverty-stricken Muslim countries such as Pakistan do not have the

funds to invest in research because their more immediate concerns are to provide basic necessities to the population. However, one of the most dismaying findings of the report is the dismally low rate of research investments made by the members of the Gulf Cooperation Council (GCC, the economic union of six oil-rich gulf countries Saudi Arabia, Kuwait, Bahrain, Oman, United Arab Emirates, and Qatar with a mean per capita GDP of over \$30,000, which is comparable to that of the European Union). Saudi Arabia and Kuwait, for example, invest less than 0.1% of their GDP in research and development, far lower than the OIC average of 0.5%.

So how does one go about fixing this dire state of science in the Muslim world? Some fixes are rather obvious, such as increasing the investment in scientific research and education, especially in the OIC countries that have the financial means and are currently lagging far behind in terms of funds made available to improve the scientific infrastructures. Guessoum and Athar also highlight the importance of introducing key metrics to assess scientific productivity and the quality of science education. It is not easy to objectively measure scientific and educational impact, and one can argue about the significance or reliability of any given metric. But without any metrics, it will become very difficult for OIC universities to identify problems and weaknesses, build new research and educational programs, and reward excellence in research and teaching. There is also a need for reforming the curriculum so that it shifts its focus from lecture-based teaching, which is so prevalent in OIC universities, to inquiry-based teaching in which students learn science hands-on by experimentally testing hypotheses and are encouraged to ask questions.

In addition to these commonsense suggestions, the task force also put forward a rather intriguing proposition to strengthen scientific research and education: Place a stronger emphasis on basic liberal arts in science education. I could not agree more because I strongly believe that exposing science students to the arts and humanities plays a key role in fostering the creativity and curiosity required for scientific excellence. [Science is a multi-disciplinary enterprise \(6\)](#), and [scientists can benefit greatly from studying philosophy, history, or literature](#). (7) A course in philosophy, for example, can teach science students to question their basic assumptions about reality and objectivity, encourage them to examine their own biases, challenge authority, and help them understand the importance of doubt and uncertainty, all of which will likely help them become critical thinkers and better scientists.

However, the specific examples provided by Guessoum and Athar do not necessarily indicate a support for this kind of a broad liberal arts education. They mention the example of the newly founded private Habib University in Karachi that mandates that all science and engineering students also take classes in the humanities, including a two-semester course in “hikma” or “traditional wisdom.” Upon reviewing the [details of this philosophy course on the university's website \(8\)](#), it seems that the course is a history of Islamic philosophy focused on antiquity and pre-modern texts that date back to the “Golden Age” of Islam. The task force also specifically applauds an online course developed by Ahmed Djebbar. He is an emeritus science historian at the University of Lille in France, which attempts to stimulate scientific curiosity in young pre-university students by relating scientific concepts to great discoveries from the Islamic “Golden Age.” My concern is that this is a rather Islamocentric form of liberal arts education. Do students who have spent all their lives

growing up in a Muslim society really need to revel in the glories of a bygone era in order to get excited about science? Does the Habib University philosophy course focus on Islamic philosophy because the university feels that students should be more aware of their cultural heritage, or are there concerns that exposing students to non-Islamic ideas could cause problems with students, parents, university administrators, or other members of society who could perceive this as an attack on Islamic values? If the true purpose of liberal arts education is to expand the minds of students by exposing them to new ideas, wouldn't it make more sense to focus on non-Islamic philosophy? It is definitely not a good idea to coddle Muslim students by adulating the "Golden Age" of Islam or using kid gloves when discussing philosophy in order to avoid offending them.

This leads us to a question that is not directly addressed by Guessoum and Osama: How "liberal" is a liberal arts education in countries with governments and societies that curtail the free expression of ideas? The Saudi blogger [Raif Badawi was sentenced to 1,000 lashes and 10 years in prison](#) (9) because of his liberal views that were perceived as an attack on religion. Faculty members at universities in Saudi Arabia who teach liberal arts courses are probably very aware of these occupational hazards. At first glance, professors who teach in the sciences may not seem to be as susceptible to the wrath of religious zealots and authoritarian governments. However, the above-mentioned interdisciplinary nature of science could easily spell trouble for freethinking professors or students. Comments about evolutionary biology, the ethics of genome editing, or discussing research on sexuality could all be construed as a violation of societal and religious norms.

The 2010 study [Faculty perceptions of academic freedom at a GCC university](#) (10) surveyed professors at an anonymous GCC university (most likely Qatar University since roughly 25% of the faculty members were Qatari nationals and the authors of the study were based in Qatar) regarding their views of academic freedom. The vast majority of faculty members (Arab and non-Arab) felt that academic freedom was important to them and that their university upheld academic freedom. However, in interviews with individual faculty members, the researchers found that the professors were engaging in self-censorship in order to avoid untoward repercussions. Here are some examples of the comments from the faculty at this GCC University:

"I am fully aware of our culture. So, when I suggest any topic in class, I don't need external censorship except mine."

"Yes. I avoid subjects that are culturally inappropriate."

"Yes, all the time. I avoid all references to Israel or the Jewish people despite their contributions to world culture. I also avoid any kind of questioning of their religious tradition. I do this out of respect."

This latter comment is especially painful for me because [one of the heroes who inspired me to become a cell biologist](#) (11) was the Italian Jewish scientist Rita Levi-Montalcini. She revolutionized our understanding of how cells communicate with each other using growth factors. She was also forced to secretly conduct her experiments in her bedroom because the

Fascists banned all “non-Aryans” from going to the university laboratory. Would faculty members who teach the discovery of growth factors at this GCC University downplay the role of the Nobel laureate Levi-Montalcini because she was Jewish? We do not know how prevalent this form of self-censorship is in other OIC countries because the research on academic freedom in Muslim-majority countries is understandably scant. Few faculty members would be willing to voice their concerns about government or university censorship, and admitting to self-censorship is also not easy.

The task force report on science in the universities of Muslim-majority countries is an important first step toward reforming scientific research and education in the Muslim world. Increasing investments in research and development, using and appropriately acting on carefully selected metrics, as well as introducing a core liberal arts curriculum for science students will probably all significantly improve the dire state of science in the Muslim world. However, the reform of the research and education programs needs to also include discussions about the importance of academic freedom. If Muslim societies are serious about nurturing scientific innovation, then they will need to also ensure that scientists, educators, and students will be provided with the intellectual freedom that is the cornerstone of scientific creativity.

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