

This document is published in:

**J. A. Ruipérez-Valiente, and J. Reich,
"Participation of the Arab World in MOOCs".
Learning With MOOCs, Madrid, 2018.**

DOI: 10.1109/LWMOOCS.2018.8534650

<https://ieeexplore.ieee.org/document/8534650>

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Participation of the Arab World in MOOCs

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Abstract—One of the original purposes of MOOCs is to democratize education worldwide in order to advance towards a fairer society and universal human development. However, initial findings suggest that there are a number of challenges that MOOCs face to achieve their maximum potential in developing countries and regions with complex issues of access to high quality education. The majority of research studies on MOOCs focus on one or a small number of courses, or an overview of an entire platform or system, such as edX or FutureLearn. However, these kinds of investigations can mask important regional variation in different parts of the world. In this study we conduct a longitudinal analysis using data from six years of courses from MITx and HarvardX, focusing on the particular Arab world sub-population, and comparing to the rest of the world and also on their human development index. A close investigation of this subpopulation will help us better understand what kinds of course registration and course-taking patterns are influenced by regional cultural factors, and what dimensions of MOOC learning are more universal. In this work we present initial results after conducting exploratory analysis on 452 MOOCs (~ 4.5M unique learners) from MITx and HarvardX, which show that despite the important cultural and geographical contrasts, the general trends are quite similar. Still, we observe some significant differences, such as lower completion metrics for Arabic countries when performing this comparison within each human development category and also some differences in percentage of enrolments per course category.

Keywords—MOOCs, global learning, development countries

I. INTRODUCTION

Massive Open Online Courses (MOOCs) offered by organizations such as edX and Coursera have been around for more than 6 years and the initial hype has turned into a more stable and sustainable ecosystem. One of their main promises was to increase access to high-quality educational materials for people around the world [1], [2]. Achieving a more equal and democratized education worldwide should be one of the top priorities for advancing towards a fairer society and universal human development. However, early research from MOOCs [3], along with broader research about education technology [4], suggests that technological, social, and cultural barriers may make it unlikely that MOOCs can close the “global achievement gap” without greater attention towards designing for educational equity [5].

One challenge in studying a global phenomenon such as a MOOCs is that educational systems across the world are diverse and multifaceted. Global comparisons are useful, but understanding how MOOCs can benefit learners in diverse circumstances will require deeper regional investigation and experimentation [6]. For instance, educators have experimented

with using MOOCs to equip Tanzanian students with market-relevant IT skills [7], and researchers have investigated how different instructional messages are received differently in countries with different cultural traditions [8]. Language (most MOOCs are taught in English) can represent an added difficulty for learning, and in some occasions, it can be an insurmountable obstacle. That is why there has been some initiatives of grouping cultural and language countries within MOOC platforms, for example MiriadaX was created as the Spanish speaking initiative. In the case of the Arab world, one remarkable example is Edraak [9], which is supported by the Queen Rania Foundation for Education and Development (QRF) using Open edX technology. Some other challenges that have been reported regarding MOOCs around the Arab world are related to the lack of awareness of the population about this educational possibility and the necessity of providing more guidance to professors [10].

One way to develop a deeper understanding of the regional variation in MOOC registration and usage is to start delving into specific regions of the world. In this study, we investigate the participation of learners from the Arab world in the MITx and HarvardX portfolio. By investigating how these users in the Arab world differ from the rest of students globally, or by students from countries with similar levels of development but different cultural contexts, we can better understand regional variation in MOOC adoption and usage. More precisely, as part of this study we want to delve into the following research questions:

- A) Which are the demographics of Arab learners, also compared to other learners?
- B) How are MOOCs distributed within Arab learners? Are some topics more appealing than others?
- C) What is the level of activity and performance of Arab learners compared to other learners? Did it evolve over the years?

II. METHOD

A. MOOC Data

In this study, we examine the demographics of students and patterns of usage on a portfolio of 452 MOOCs delivered by MITx and HarvardX on edX platform from 2012 to 2018. Across these courses, we have 4,467,478 unique learners with 9,260,967 total course registrations, which means that on average a student is taking 2.07 MOOCs from this portfolio. The average MOOC has 45.25k learners per MOOC, with a standard deviation of 20.48k. These estimates don't adjust for learners who may

maintain several accounts during their learning process for different reasons (e.g. [11]).

Assessing the nationality of a MOOC participant is essential to our comparative research. To assess the nationality of a given account, we take the modal IP address, and based on that IP we infer the country. For some cases (approximately 17.28% of unique learners), we are unable to detect the nationality via the IP, as some IP's might come from the cloud, a proxy, or sometimes they do register in a course but never view it, which leave us without trace data for the student in the course and thus unable to extract their IP. That leave us with a final dataset of 3,695,162 unique learners.

B. Defining the Arab World

For the definition of the Arab world cohort we have followed the country designation provided by Wikipedia¹, which includes the following list of 22 countries: Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, State of Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, and Yemen. We will use a number of metrics² from the United Nations (UN) such as the human development index and human development category (low, medium, high and very high).

III. BASIC FINDINGS

A. Participation as a Proportion of Population.

According to the UN data, the 22 countries of the Arab world have 423 million residents, and make up approximately 5.5% of the world's 7.6 billion people. Their representation in MOOCs, however, is slightly lower than one would expect based on their population. Only 140,994 (3.82%) of MITx and HarvardX registrants in our dataset are connected from Arab world countries. The important differences in populations of each country will have an effect in the number of enrolments and learners connected from each country. Therefore, it makes sense to normalize with respect to the population of each country. We define the metric 'learners per million inhabitants', which is computed dividing the number of unique learners in one country by the population as reported by the UN in that country. This metric allows for better between-country comparisons; once we apply it, we find an average of 333.54 learners per million inhabitants connected from Arab countries, and 492.94 learners per million inhabitants connected from the rest of countries. Table 1 shows per country the number of unique learners, the percentage that value represents within the Arab population and the number of learners by million inhabitants. Egypt, Saudi Arabia and United Arab Emirates are the most representative nationalities of the Arab cohort while Djibouti, Mauritania and Comoros are the least representative. After normalizing those stats by the population of each country we can see United Arab Emirates, Qatar and Bahrain with very high proportion of learners (1766, 1443 and 982 learners per million inhabitants), on the other edge we see Comoros, Yemen and Mauritania with only 16, 32 and 36 learners per million

inhabitants. Not surprising, we find a strong correlation ($r = 0.7$, $p < 0.001$) between the human development index and the ratio of learners by million habitants when we apply a Person correlation.

TABLE I. ARAB WORLD COUNTRIES OVERVIEW

Country	Unique learners	Percentage of all Arabs country learners	Learners by million inhabitants
Egypt	45,406	32.2 %	456.91
Saudi Arabia	17,134	12.15 %	510.63
United Arab Emirates	16852	11.95 %	1766.16
Morocco	15780	11.19 %	436.01
Algeria	7461	5.29 %	177.61
Tunisia	5052	3.58 %	177.61
Jordan	5024	3.56 %	507.28
Lebanon	3931	2.79 %	645.11
Qatar	3890	2.76 %	1443.49
Sudan	3324	2.36 %	80.07
Iraq	2983	2.12 %	78.83
Kuwait	2570	1.82 %	612.32
Oman	2163	1.53 %	447.83
Syrian Arab Republic	2039	1.45 %	111.52
State of Palestine	1877	1.33 %	371.48
Somalia	1714	1.22 %	112.9
Bahrain	1539	1.09 %	982.14
Yemen	934	0.66 %	32.3
Libya	851	0.6 %	131.51
Djibouti	291	0.21 %	299.57
Mauritania	165	0.12 %	36.34
Comoros	14	0.01 %	16.82

B. Demographic Comparisons between the Arab World and the Rest of the World.

Table 2 shows a number of demographical statistics of learners per each variable separated by the two cohorts. Many of the demographical patterns that have been reported in previous studies (e.g. [12]) are also found in the Arab world. Most Arab world registrants already have a bachelor's degree, and the distribution of degree attainment is similar to MOOC registrants as a whole. MOOC registrants are also similar to other MOOC registrants in terms of age and gender, with a somewhat higher proportion of male learners than found in the rest of the world, and a slightly younger population in learners from the Arab world.

C. Course Distribution

Based on the population of each cohort and the number of enrollments, the average Arab learner enrolls in 2.47 MOOCs while the average learner in the rest of countries enrolls in an average of 2.25 MOOCs. Next table shows the enrolment percentage by the two populations in the following four domains: CS (Computer Science), GHSS (Government, Health and Social Sciences), HHRDE (Humanities, History, Design, Religion and Education) and STEM (Science, Technology,

¹ https://en.wikipedia.org/wiki/Arab_world

² <http://hdr.undp.org/en/content/human-development-index-hdi>

Engineering and Mathematics) while also crosstabulating on gender. The results reflect previously reported general trends such as female gender being less interested in CS and STEM than male. When we perform this comparison within each gender and between regions we see a higher interest for both genders in STEM for Arabic learners, and some other minor differences, that maybe the most interesting is Arabic women being slightly more interested in CS while Arabic men are less interested, which is in agreement with some previous reports [13].

TABLE II. DEMOGRAPHICAL STATISTICS OF LEARNERS BY COHORT

Metric		Arab countries (N = 140,994)	Rest of countries (N = 3,554,168)
Level of Education	Doctorate	2.66%	3.59%
	Master's	16.28%	20.94%
	Bachelor's	36.08%	29.61%
	Associate	3.97%	4.34%
	High/Middle/Primary school	25.1%	22.67%
	Other	3.15%	1.95%
	Non-responded	12.76%	16.9%
Gender	Female	23.63%	27.2%
	Male	65.63%	57.17%
	Other/Prefer not to say	0.21%	0.53%
	Non-responded	10.53%	15.1%
Birth date	Median	1991	1988
	Mode	1993	1992

TABLE III. ENROLMENT PERCENTAGES PER AREA OF KNOWLEDGE

Gender	Region	CS	GHSS	HHRDE	STEM
Female	Arabic	23.1%	28.3%	16.3%	32.3%
	Rest	22.3%	30.3%	23.1%	24.2%
Male	Arabic	30.7%	24.8%	8.3%	36.1%
	Rest	33.3%	24.2%	11.3%	31.2%

D. Course Performance

We present some course performance results based on the following four percentage metrics: viewed (they accessed the course), explored (they viewed at least half of the chapters), completed (they achieved a passing grade) and certified (they completed the course and received a certificate of completion). The total number of enrollments in the Arab group is 348,202, while the total for the rest of the countries is 7,986,252. Figure 1 shows a funnel tunnel for course outcomes by cohort. The differences are not extreme, but we can see a clear trend that shows lower values in all of the steps for the Arab world population.

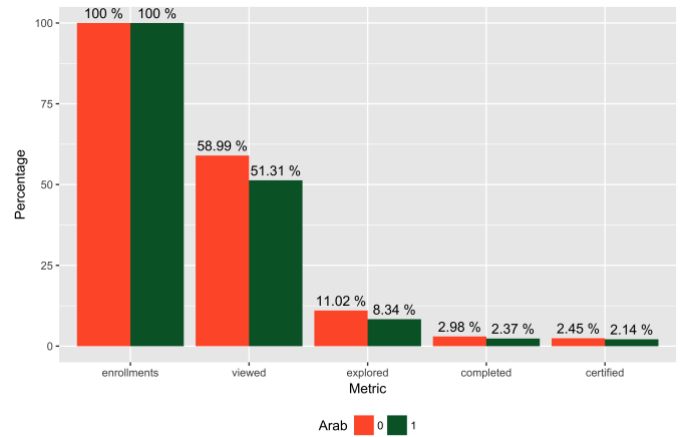


Figure 1. Funnel tunnel of course outcomes by cohort.

Now, there might be a bias in previous comparison based on the fact that we are comparing quite different countries. In order to perform a fairer comparison, we will replicate the same analysis within each one of the human development categories as defined by the UN. Figure 2 shows a line chart with this replication, where the results show that for low human development the metrics are quite similar, but for the rest of the categories the trend where non-Arabs have better completion metrics replicates clearly.

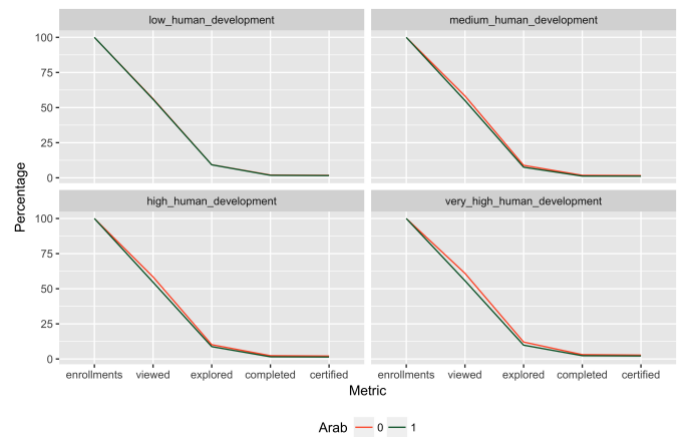


Figure 2. Funnel tunnel by cohort within each category of human development index.

E. Temporal Evolution

The evolution of this population also represents an area of interest. Figure 3 shows the temporal evolution of so metrics in a four-plot graphic. The upper-left plot shows the evolution in number of learners per million inhabitants, and the rest of plots show the percentage of courses viewed, explored and completed. Note the y-axis is free for every plot, thus adapting the upper and lower y limits for each variable distribution. We can see a visible peak of MOOC completion metrics during the first year of MOOCs in 2012 and a stable growth in enrolments between 2012-2016 with a valley that changes the previous rising trend in 2017. In terms of comparison, the plot shows a

very synced trend between both populations with a slight change in the percentage of completed for the year 2017, where the Arab cohort rises almost to the same level.

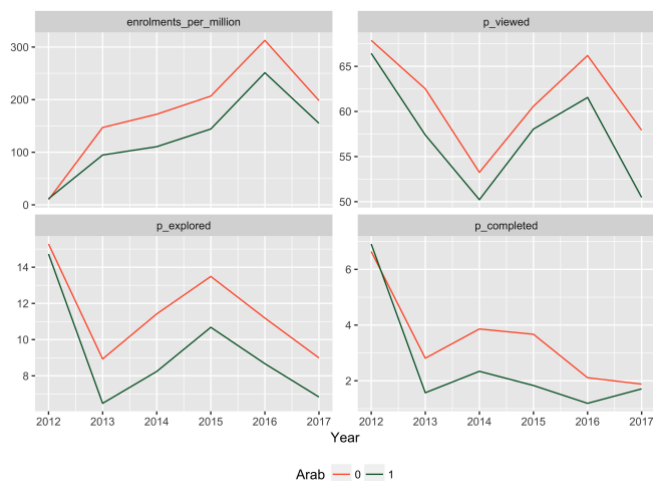


Figure 3. Evolution of enrolments per million inhabitants and participation metrics between 2012-2017 (2018 data was removed because it is not complete).

IV. CONCLUSIONS

Many Europeans see the Arab world as a distinct place, with a distinctive language, religion, and culture. Viewed through the lens of MOOCs however, an initial scan shows few differences between learners from Arab countries and learners from the rest of the world—these common patterns suggest that for all the great cultural variation in the world, there may be a common, and very human, desire to pursue learning, alongside universal challenges in maintaining motivation and self-regulation.

That said, we did find a number of differences that are worth mentioning. We showed that the average Arab learner enrolls in more MOOCs than the rest of learners. However, we also reported that the completion metrics are globally worse for Arab learners, and these results replicated when applied separately for the countries of each human development category. This might suggest that Arab learners are just more likely to enroll with no clear completion intentions, or that they might be struggling to progress on these MOOCs more than other learners or that their goals for enrolling into these courses are just different than the regions. More research is needed to provide a response for such questions.

The future steps that we are taking include a more detailed quantitative analysis connecting these results with survey data

as well and replicating in other MOOC environments. We also want to connect this future analysis with qualitative data by mapping specific country policies, political affairs or war conflicts with MOOC patterns, so that we can delve into the impact of such issues in global online education. Other ideas for extension involve tactics to enable a better between-country comparison and alternative ways to assess the nationality of emigrant Arab learners.

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