



WILL THE TECHNOLOGY DISRUPTION WIDEN OR CLOSE THE SKILLS GAP IN THE MIDDLE EAST AND NORTH AFRICA?

How educational technology can help prepare Arab youth for the changing nature of work and the most important skill of the 21st century: learning to learn.

Maysa Jalbout
Samar Farah

B | Global Economy
and Development
at BROOKINGS



Maysa Jalbout is a nonresident fellow at the Center for Universal Education at the Brookings Institution.

Samar Farah is a doctoral candidate at Teachers College, Columbia University.

Acknowledgments:

The authors are indebted to Sanjay Sarma (vice president for open learning, Massachusetts Institute of Technology, MIT) and M. S. Vijay Kumar (associate dean & senior strategic advisor of digital learning, MIT), Rebecca Winthrop (senior fellow and director of the Center for Universal Education at the Brookings Institution) and Esther Care (associate professor and deputy director of the Assessment Research Centre in the Graduate School of Education at the University of Melbourne), all of whom reviewed a draft of the working paper and shared their feedback generously.

The authors benefited from the insights of many industry leaders and experts. Many thanks to Fadi Ghandour (managing partner, Wamda Capital), Said Darwazah (chairman and CEO, Hikma Pharmaceuticals), Nasser Marafih (Ooredoo Board member), Rami Alturki (president and CEO, Alturki Group), Majid Jafar (CEO, Crescent Petroleum), Mohammad Al Bakri (vice president, information technology, Saudi Airlines), Wael Al Lawati (CEO, Omran Tourism Development Company), Mohammed Al Shaya (executive chairman, Al Shaya Co.), Iyad Malas (group CEO, Al Futtaim), Mustafa Abdel-Wadood (partner, Abraaj Group), Mohammed Al Ardhi (chairman, National Bank of Oman), Fahad Al-Sukait (CEO, Al Arab News), Rabea Ataya (CEO, Bayt.com), Ali Matar (head, MENA LinkedIn Talent), Wael Fakhrany (regional business lead, Google MEA), Hussein Freijeh (managing director, Yahoo MEAT), Charbel Fakhoury (vice president, enterprise services, Europe, Middle East and Africa, Microsoft), Amr Khashoggi (senior vice president, corporate affairs, Zahid Group), Waleed Al Banawi (chairman, JISR), Abdul Salam Haykal (CEO, Haykal Media), Hazem Galal (partner, PwC), Natasha Ridge (executive director, Al Qasimi Foundation), Dahlia Khalifa (previously regional head of the E4E Initiative for Arab Youth, World Bank), Maha Taibah (CEO, 360°, and adviser to the minister of labor in Saudi Arabia), Nader Kabbani (director of research and policy, Silatech), Yasar Jarrar (adviser, Bain & Company), Abdulla Al Karam (chairman of the Board of Directors and director-general of the Knowledge and Human Development Authority of Dubai), Sultan Abu-Orabi Aladwan (secretary-general, Association of Arab Universities), Marwan Awartani (president, Palestine Technical University), Hassan Diab (interim chief operating officer and vice president for regional external programs,

American University of Beirut), Simon Thacker (education specialist, World Bank), Marwan Tarazi (director, Center for Continuing Education, Birzeit University), Abood Al Sawafi (vice chancellor / president, A'Sharqiyah University), Basri Salmoodi (assistant deputy minister, Ministry of Education and Higher Education, Palestinian Territories), Hussein Al-Nasrawi (Amarah Technical Institute), Mark Surman (executive director, Mozilla Foundation), Martin Roeske (chief program officer, Silatech), Haif Bannayan (CEO, Queen Rania Teacher Academy), Maryam Al Hajri (director of corporate social responsibility, Ooredoo Group), Selim Eddé (vice president for government relations, SAP), Frank Hagemann (acting regional director, Arab states, International Labor Organization), Danielle Goldstone (founding director, Ashoka), Bill Reese (president and CEO, International Youth Foundation), Marianne Bitar Karam (country director, DOT Lebanon), Connie Yowell (MacArthur Foundation), Khalid Alkhudair (founder and CEO, Glowork), Yazeed Sheqem (director of programs and strategy, Middle East / Africa, SoukTel), Ahmed El Alfi (founder and chairman, Nafham), Mostafa Farahat

(general manager, Nafham) and Dina Bokai (course design and operations manager, Edraak).

The authors would also like to recognize the contribution of Nicole Lopez del Carrilas, who was our research assistant for the early stages of the working paper's writing.

The Brookings Institution is a nonprofit organization devoted to independent research and policy solutions. Its mission is to conduct high-quality, independent research and, based on that research, to provide innovative, practical recommendations for policymakers and the public. The conclusions and recommendations of any Brookings publication are solely those of its author(s), and do not reflect the views of the Institution, its management, or its other scholars.

Brookings recognizes that the value it provides is in its absolute commitment to quality, independence and impact. Activities supported by its donors reflect this commitment and the analysis and recommendations are not determined or influenced by any donation.

CONTENTS

Introduction1

Methods..... 4

1. The persistent challenge of low skills among Arab youth 5

 Significant gains in access to education have not included vulnerable youth..... 5

 The low quality of education has resulted in a learning crisis 5

 Arab youth are suffering from unemployment and a long “waithood” 6

 High unemployment and low education quality point to a skills mismatch 8

 Although the rise in entrepreneurship is promising, its success also depends on
 addressing the skills gap 9

2. Five trends redefining work and the skills Arab youth need..... 10

 The first trend: Longer working lives necessitate lifelong learning..... 10

 The second trend: More automation demands more creative workers.....11

 The third trend: The growth in big data and R&D requires stem education11

 The fourth trend: Greater access to information makes media literacy critical 13

 The fifth trend: Increasingly interconnected work creates more
 flexibility and opportunity..... 14

3. Reimagining youth learning and skills development in MENA through ed tech 16

 The first initiative: Increasing access to a high-quality formal education 16

 Case study 1: Nafham.....17

 The second initiative: Using new media to improve teaching and learning,
 both inside and outside the classroom17

 Case study 2: Jordan Education Initiative 19

 The third initiative: Preparing learners for the jobs of the future 19

 Case study 3: The rise of computer programming in the MENA region20

 The fourth initiative: Using big data to align learning with the job market 21

 Case study 4: Doroob.....22

 The fifth initiative: Adopting ongoing metrics and performance analytics for
 assessing and personalizing learning22

 Case study 5: EdX blended learning classes 23

 The sixth initiative: Promoting lifelong learning and skills development
 through open online and blended learning.....24

 Case study 6: Edraak25

4. Recommendations for how technology can help close the skills gap in MENA.....	26
References	31

LIST OF FIGURES AND TABLES

Figure 1. Share of grade 8 students achieving international benchmarks in science, 2011.	6
Figure 2. Percentage share of MENA youth who are not in employment, education or training.....	7
Figure 3. Distribution of employment across nonagricultural sectors in the MENA region	12
Table 1. The trends redefining learning and work and the skills arab youth need for their future	15

WILL THE TECHNOLOGY DISRUPTION WIDEN OR CLOSE THE SKILLS GAP IN THE MIDDLE EAST AND NORTH AFRICA?

Maysa Jalbout
Samar Farah

INTRODUCTION

The dominant narrative about Arab youth is deeply worrying. A generation of Syrians, Iraqis, Libyans, Sudanese, and Yemenis are without an education and are losing their futures to intractable conflict. Arab youth form the largest demographic in the Middle East and North Africa (MENA), but rather than being viewed as a gift to the region, they are seen as a liability. Yet few leaders have had the foresight to understand that remedying disfranchisement and uprooting extremism cannot be achieved without creating opportunity and seeding hope among these youth.

In the past 15 years, important progress has been made in the field of education in the Arab world. This includes increasing universal primary access by 10 percent, increasing youth and adult literacy by 22 percent, and achieving greater gender parity at the primary level in several countries.

However, as important as these gains have been, they have not delivered the desired learning outcomes and the skills required by the labor market. *The Arab World Learning Barometer* (Brookings 2014) estimates that 50 percent of children in school are not meeting

basic international literacy and numeracy proficiency standards. At the same time, private sector employers in the region believe that the low quality of education is the cause of the skills mismatch and is also thus an impediment to economic growth (ILO 2015).

Countless reports have been written warning of the dangers of an Arab youth population growing disenfranchised and calling on governments in the region to respond with education and economic reform (Bardak, Huitfield, and Wahba 2006; ITU 2014). For the most part, however, these reports have been met by independent initiatives rather than by systemic change efforts.

In drawing up their 2030 Sustainable Development Agenda, the countries in the region must redesign their education systems to be smarter and work more effectively to support their youth, helping them gain the skills they need to be prepared not just for the present but also for the future of work.

This working paper identifies reasons to be hopeful. In every country in the MENA region, Arab youth, entrepreneurs, civil society advocates, and others are attempting to bring about positive change for

both youth and their communities through innovative education initiatives. Some governments have also helped to drive important progress for their youth. At present, more youth are graduating from secondary and tertiary schools and programs than ever before (World Bank 2015). In some countries, young women have raced past young men in their educational achievement and completion rates (UNESCO 2015). And several countries, especially the Gulf states, are committed to education reform and thus are making large investments to advance their education systems.

Moreover, a growing number of leaders in the Arab world recognize that incremental education reform is not enough. The rapid evolution of information technology has ushered in the Information Age, creating a fundamentally different world of work than what the region has been preparing its youth for (Castells 2011).

This working paper highlights five major trends that point to a tremendous opportunity for the Arab world to use technology to leapfrog in making educational advances. These trends can be summarized as follows:

1. Longer life expectancies are requiring young people to plan for more working years, thus requiring them to become lifelong learners. They also need to become generalists or transdisciplinary.
2. More automation is bringing an end to traditional jobs. There is a need to develop opportunities for highly skilled workers and to enhance formal skills such as communication and problem solving.
3. The explosion of the data analytics field has seen a rise in demand for higher-order analytical skills and advanced digital literacy, as well as strengths in science, technology, engineering, and math (STEM) subjects, in particular computer programming.

4. The rise of new forms of media is changing the nature of learning and our understanding of how children learn. Gaming, animation, and other types of virtual networks are demanding a new form of literacy and are promoting new models for collaboration and communication.
5. As the nature of work is changing, so also are the structures of organizations, which are shifting toward being interconnected. They are becoming more diverse, not only in their makeup but also in their operations, resulting in more flexibility and opportunity. This, in turn, means that workers are expected to become more adaptable to changing environments, have an awareness of various cultures and know how to function and communicate in virtual environments.

Put simply, information technology has shifted the learning goalpost for Arab youth. They are now required not only to learn basic skills, such as numeracy and literacy, but also to demonstrate adaptability, creativity, and above all an aptitude for learning to learn—autonomously and continuously.

To meet these requirements, the governments in the Arab world cannot make the needed leap in education on their own; nor are they anymore seen as the sole drivers in this process. They need the investments and know-how of business and civil society to help them develop innovative, collaborative, and scalable solutions to address the Arab youth learning and unemployment crises.

Among the most promising investments being made in the region are increasingly those in educational technology (ed tech) initiatives, which involve the use of various technological tools and resources to facilitate learning both in and outside the classroom. These initiatives are aimed at rethinking educational solutions, providing new methods and models for addressing old

problems, and ultimately enabling Arab youth to write their own new and more promising narrative, built on the foundation of a good education and positive prospects for the world of work.

Given these realities, this working paper makes the case for building an education ecosystem that prepares Arab youth for the future of work. Alongside deep and swift education reform, there is an opportunity to accelerate progress by investing in ed tech initiatives that address several areas of weakness in the regional education landscape and encourage a fundamental shift toward a culture of learning to learn. The working paper draws on six case studies of ed tech projects in the Arab region to demonstrate potential ways to:

1. Increase access to formal education through digital learning.

2. Improve the quality of teaching and learning, both in and outside the classroom.
3. Develop new skills and prepare youth for the jobs of the future.
4. Use big data to align learning with the job market in the region.
5. Adopt ongoing metrics and performance analytics to assess students' needs and personalize learning to meet these needs.
6. Promote lifelong learning and skills development through open online and blended education.

The working paper concludes with a set of 10 recommendations intended to contribute to addressing the youth skills gap and to provide guidance for future investments in ed tech in MENA.

METHODS

This working paper has one guiding question: How can technology prepare Arab youth for the new demands of learning and working? More specifically, the working paper examines (1) the changing nature of work in the 21st century and (2) the new skills that are required for youth to succeed in this environment. It does so in the context of the MENA region, which, despite its efforts to catch up with the West, continues to trail behind in providing its youth with globally competitive educational and employment opportunities.

The working paper has been informed by the insights of over 50 high-level industry leaders, education experts, philanthropists, and technology investors from both within and outside MENA. Input was sought in the form of a series of interviews, a roundtable and many consultations and observations at workshops and conferences in 2014 and 2015. This input helped better explain the nature of future jobs in the region, the skill sets they will require and the strategies to better prepare young Arabs to be more competitive for these jobs. It also identified gaps in the current discourse on youth unemployment and education and confirmed the unfulfilled potential of technology for addressing these gaps.

This input was analytically juxtaposed against the literature on the future of work, which is based on assessments and projections developed by a range of international research institutes and organizations. This analysis was crucial to pinpointing the types of skills that will be demanded of Arab youth in order to succeed in the 21st century.

The literature review also makes clear the dearth of studies that consider the implications of the information technology evolution for education and work. At the same time, despite the increasing number of ed tech start-ups in the MENA region, most are in their early

stages of growth, and few studies have evaluated their impact or explored how ed tech could contribute most effectively to learning and skills development. This is especially the case for those Arab youth who need the most support, such as refugees, other underserved populations and those with poor learning outcomes.

Although the working paper does not evaluate or endorse the six ed tech initiatives that are presented as case studies below, they do provide useful illustrations of the current innovations in the MENA region and the growing efforts to address traditional challenges in novel ways. Though the working paper includes some of the key players in ed tech in MENA, it does not give an exhaustive account of all these investments. Where the working paper was not able to identify specific region-based initiatives, it draws on cases from outside the region to illustrate the potential benefits of investment.

The recommendations made in this working paper calling for investment in ed tech are rooted in a belief that, if used appropriately, technology can enable more effective teaching and learning. In line with the mixed evidence for the impact of technology on education (OECD 2015), the working paper does not claim that the mere introduction of technology is a solution to educational problems in the region and beyond. However, it can act as an accelerator, providing greater access to learning opportunities as well as more advanced infrastructure to support the educational process and to better prepare students for their lives ahead (Cristia, Czerwonko, and Garofalo 2014; Bet, Cristia, and Ibarrarán 2014).

In recent years, the MENA region has struggled to adapt to the technologically advanced world. This situation has affected the region's youth, who face limited prospects due to the low quality of education and few work opportunities available to them. These challenges are discussed in the following section.

1. THE PERSISTENT CHALLENGE OF LOW SKILLS AMONG ARAB YOUTH

More than half the 369 million people living in the Middle East and North Africa (MENA) region are under the age of 25 years (Lanvin and Rodriguez-Montemayor 2015). This is the highest proportion of youth in the world as compared with other regions (Steer, Ghanem, and Jalbout 2014). In a largely aging world, MENA's large youth population presents a significant opportunity—but one that has so far been untapped, because the region also has the world's highest youth unemployment rates, particularly among females. In fact, due to the unstable political and economic climates in many of the region's countries, this situation is seen not as an opportunity but as a potential threat to the safety and stability of the region and beyond.

Significant gains in access to education have not included vulnerable youth

In the MENA region, significant socioeconomic improvements have been achieved in recent decades with the rise in living standards and literacy rates, as well as the expansion of access and educational attainment, especially among girls, across all stages of education. However, the region's pace of development has not been fast enough to accommodate its growing population of children and youth. Access to and retention in education remains low, especially among poor girls in rural communities; approximately 8.6 million children have never enrolled in primary or lower-secondary education, and a high percentage of youth are dropping out of school (Steer, Ghanem, and Jalbout 2014). This dropout rate is even higher among males at the secondary school level, particularly in the Gulf states, where the incentives to remain in school are falling and there are few remedial programs to pro-

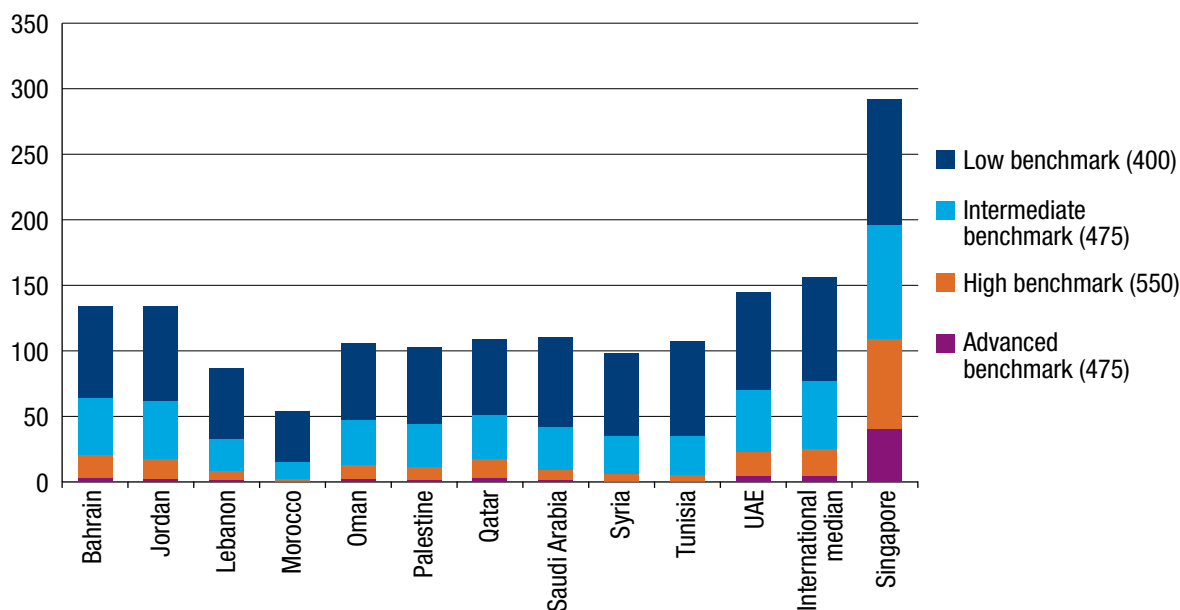
vide these men with the necessary support to stay in school (Ridge 2014).

This situation is further compounded by the growing number of refugees in the region in recent years as a result of the crises in Syria, Iraq, Yemen, Libya, and Sudan. At present, over 640,000 Syrian refugee children are out of school in the five neighboring countries of Jordan, Lebanon, Turkey, Egypt, and Iraq (UNICEF 2015). This crisis is placing significant pressure on the host countries' already-overstretched ministries of education. Without sufficient financial and technical support, this is likely to lead to less education for all children living in these countries. Although national efforts, with international support, are ramping up to provide refugee children with educational opportunities, investments in secondary and postsecondary school are still extremely limited, leaving youth disproportionately affected, with few choices beyond informal, low-skilled employment (mainly for males).

The low quality of education has resulted in a learning crisis

The region's quality of education itself has not been high enough, leaving Arab youth uncompetitive and underqualified compared with their peers in other regions. According to international educational assessments—such as the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA)—the quality of education in all countries in the MENA region is below the global average. On average, most students (40-60 percent) were only able to achieve the lowest international benchmark in the TIMSS assessment, as seen in figure 1 (Martin et al. 2012; OECD 2014). In other words, the remaining students could not even reach the lowest international benchmark for the eighth grade.

Figure 1. Share of grade 8 students achieving international benchmarks in science, 2011



Source: Martin et al. (2012).

In addition to their low performance in the sciences, students in the MENA region have the lowest levels of English proficiency in the world, and these rates are continuing to fall (English First 2015b). These results illustrate the extent to which all countries in the region, regardless of their wealth and investments in education, have not been able to achieve the education gains for which they aimed.

Arab youth are suffering from unemployment and a long “waithood”

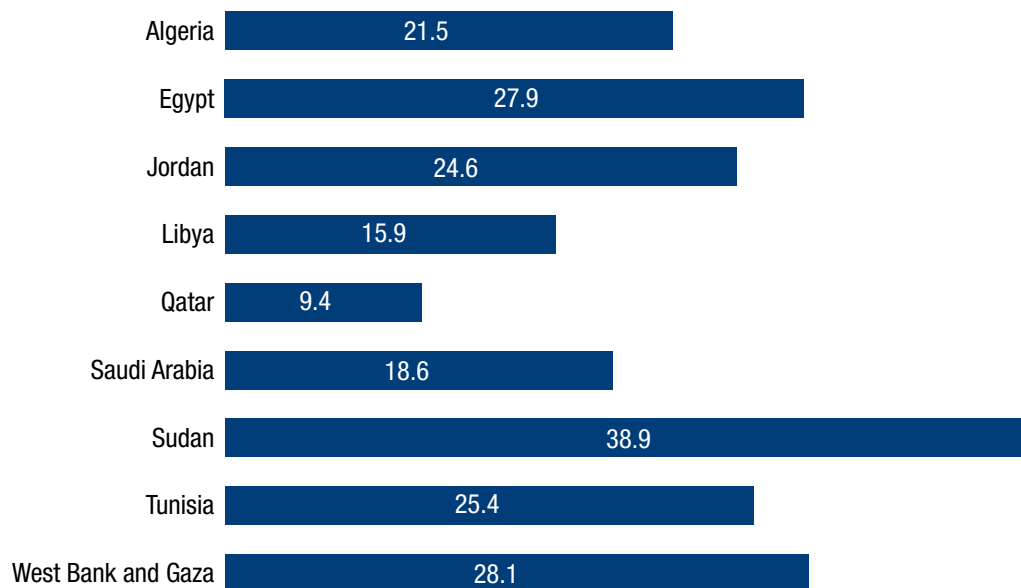
Given its large youth population, the MENA region has experienced the highest rates of labor market growth in the world, accounting for about 2.7 percent per year (Education for Employment 2014). Yet in 2014 the region also suffered from the world’s highest youth unemployment rates, about 24 percent for males and

46 percent for females (ILO 2015a). This is because the region’s economies have not been able to absorb their growing youth populations (ILO 2015a). Factors that have contributed to these high unemployment rates include large public sectors offering youth stability, benefits, and better working conditions than the private sector;¹ a high reservation wage, that is, the phenomenon of youth forsaking potentially productive employment due to their preference to wait for a better job; inflexible labor regulations; and a skills mismatch (Ahmed, Guillaume, and Fuceri 2012).

In addition to the high population of youth who are unemployed, a large population is also idle (Education for Employment 2014). Figure 2 illustrates the high rates of youth who are not in employment, education or training in the MENA region, with Sudan, Palestine, and Egypt suffering the highest rates. This category

¹ It is estimated that the central governments in the MENA region have the highest wage bill worth 9.8 percent of the GDP, as compared with 5.4 percent globally. This reflects not only the size of the public sector but also the cost of salaries, which on average are 30 percent higher than the private sector (Ahmed, Guillaume, and Fuceri 2012).

Figure 2. Percentage share of MENA youth who are not in employment, education, or training



Note: The data are for these years: Algeria, 2013; Egypt, 2013; Jordan, 2012; Qatar, 2009; Saudi Arabia, 2013; Sudan, 2009; Tunisia, 2012; and the West Bank and Gaza, 2012.

Source: ILO (2015b).

captures the large proportion of females who are not productive, with estimates as high as 40 percent among Egyptian females, as compared with about 17 percent among males (ILO 2015a).

The challenges of youth employment are especially acute in fragile or conflict-ridden states, where youth are disproportionately affected by political instability because they are likely to be displaced and thus miss important milestones in education, or need to support their families by working in the informal market, where employment is insecure, low paying and at times unsafe (Goldin et al. 2015). However, even in nonviolent contexts, youth in the region have high rates of employment in the informal sector. According to data from 2012, about 80 percent of youth living in rural areas are employed in the informal sector, where they do not have written contracts, regular pay

or benefits, and in urban areas the rate is close to 55 percent (Goldin et al. 2015).

The combination of the challenges of low-quality education and high youth unemployment rates are delaying youths' transition from education to work, leading to a phase known as "waithood." In this process, youth are held back from achieving their next milestones, such as finding employment, getting married and buying a house (Dhillon 2008). Therefore, introducing systemic changes in education are critical to bringing about meaningful improvement in the lives of youth across the region. They are, however unlikely to suffice in addressing the problem. The International Labor Organization estimates that in order for youth unemployment rates not to increase, 15 million jobs would need to be created on a yearly basis (ILO 2015a).

High unemployment and low education quality point to a skills mismatch

The region's high youth unemployment rates coupled with the low quality of education have led to a growing concern among policymakers and employers that students are not graduating with the skills needed by the labor market. The evidence from the Arab world finds that one of the consequences of the weak educational system and the lack of alignment between education and employment is a skills mismatch, whereby, according to industry experts, youth are not well equipped for the world of work today, let alone the changes that will take hold in the future. Through interviews and consultations for this working paper, industry leaders emphasized knowledge of the English language, digital literacy and other soft skills as among the most critical skills needed for the future job market in the region.

Communication skills in English, both written and oral, were noted by almost all CEOs as indispensable for any future employee. Similar recommendations were made in a survey of primarily private sector employers in the MENA region conducted by Bayt (2015). In this case, both English and Arabic were ranked by 56 percent of respondents as the most sought-after skills among potential employees. Interestingly, when surveyed about language, 63 percent of youth agreed that English is more important for their careers than Arabic (ASDA/A Burson-Marsteller 2015).

In addition, digital literacy was emphasized as being critical for success in the workplace. However, this skill no longer refers to only basic computer skills but now also reflects more advanced competencies in information and communications technologies (ICT) across various technologies. According to the International Telecommunication Union, the digital competence

framework includes the following competencies: searching for, filtering, and evaluating information; professionally communicating and engaging through technologies; developing content and programming; having the ability to protect one's data and devices; and having the skills to be creative and innovative as well as solve technical problems (ITU 2014).

Industry leaders have also stated clearly that though they previously looked for a set of key technical skills, and though these remain important, today they emphasize the need for adaptability, flexibility, and other soft skills that are developed through work experience. Because youth have often not worked in an office before their first job or were not trained in the skills needed, they do not have an understanding of the work environment. They may not know how to behave and communicate effectively with colleagues (interpersonal skills), how to communicate over the Internet (Netiquette) or what a strong work ethic entails (ITU 2014). Business leaders have noted that youth do not receive appropriate career guidance on how to prepare their résumé or how to conduct themselves in an interview, two features that significantly limit Arab students' likelihood to be invited to interviews. They also have not had sufficient exposure to the world of work in the form of internships, work placements and the like.

Once again, these findings were confirmed by a Bayt (2015) survey, which reported that skills and qualities such as being a team player (49 percent), leadership (47 percent), ability to work under pressure (43 percent) and honesty (42 percent) were all ranked above technical skills, which was 15th on the list. Similarly, a report by INSEAD found that hiring managers typically favor business acumen or customer service abilities over technical skills (Lanvin and Rodriguez-Montemayor 2015).

Although the rise in entrepreneurship is promising, its success also depends on addressing the skills gap

Given the critical need to create jobs to absorb the MENA region's high numbers of unemployed youth, the rise of entrepreneurship in the region is viewed as an important part of the solution. The region boasts the highest growth potential in this area, as compared with other regions. It is also unique in that the trend toward setting up businesses is driven largely by need rather than by choice (Schøtt, Kew, and Cheraghi 2015). Although the region does not fare well in the number of youth businesses that are being established, its businesses are the largest; a fifth of them employ at least five people. There is also evidence of growing institutional support for young entrepreneurs; about one-third of them receive funding from banks and financial institutions, although many also depend on personal savings to launch their businesses (Schøtt, Kew, and Cheraghi 2015). Finally, the MENA region has the highest number of start-ups run by females—approximately one-third of the total startups, higher than the rates in the West (Schroeder 2013).

This trend reflects a rise in the type of youth who are no longer willing and able to wait for their government to provide them with employment opportunities. Instead, they are resourceful, taking the risks necessary to pursue better work and life opportunities. To support these youth, there is a growing ecosystem of accelerators and incubators across the region, providing aspiring entrepreneurs with mentorship and investment. These include Wamda, Flat6Labs, Oasis 500, Afkar, Gaza Sky Geeks and many others (Moreau 2015).

Most of the leaders interviewed or consulted were enthusiastic about entrepreneurship, but warned that

the effective proliferation of small businesses ultimately depends on the caliber, creativity, and innovation of the region's graduates. Thus, youth choosing to become entrepreneurs could potentially suffer from the same core skill deficiencies as those who seek employment in the labor market.

A World Bank (2010) report titled *Stepping Up Skills for More Jobs and Higher Productivity* emphasizes the need to encourage entrepreneurship and innovation as one of the steps to prepare youth for the job market. It proposes doing so through partnerships across universities and businesses, and through entrepreneurship training for youth. There are a number of initiatives in the region today working to bridge this gap between youth education and work, but many of them are still nascent and small. One of the largest initiatives is INJAZ Al-Arab, a nonprofit organization modeled on Junior Achievement. It promotes work readiness through entrepreneurship, financial literacy, and soft skills programs offered to primary and secondary school students across the region. Since its launch in 1999, INJAZ has worked to better prepare youth across the region for employment, reaching almost 340,000 students across 14 countries through its programs in 2013-14 alone.

All the skills noted above represent the critical skills that workers must possess to participate in the labor market. The next section delves deeper into the trends for the future that are already having an impact on the nature of life and work and in turn on the skills that will be needed for youth to compete in more globalized and technologically-advanced workplaces.

2. FIVE TRENDS REDEFINING WORK AND THE SKILLS ARAB YOUTH NEED

A number of broad transformations—either directly or indirectly triggered by technology across the political, economic, and social spheres—have redefined the world we live in and how we work. In a globalized world, technology has eased communication and travel, as well as access to and the exchange of ideas and information. It has also altered day-to-day interactions and relationships, making the world a smaller and more connected place. Through social media outlets—such as Facebook, Twitter, Instagram, and YouTube—everyone can have a voice. The growth in online collective action has also spurred the rise of “crowd-based” activities and initiatives, whereby individuals from various regions, ethnicities, belief systems and the like are acting on behalf of shared interests to introduce changes in their societies. Technological innovations have also brought about the rise of smart services to access customized information in real time through mobile and other applications.

In this section, the working paper explores five key trends that are redefining the nature of jobs, the workplace, and the skills and competencies that will be needed for workers from the MENA region to succeed in the increasingly globalized economic market. Ultimately, these trends require an entirely different approach to learning—an approach built on preparing Arab youth to learn to learn, autonomously, and continuously.

The first trend: Longer working lives necessitate lifelong learning

One global trend that has begun to make an impact on the world of work is humans’ rising average life expectancy. With growing health awareness and

improved medical treatments, people are already living longer than at any point in history. In fact, some countries saw a rise in life expectancy of almost 30 years during the 20th century (Roser 2015). This, in turn, means that people are spending more years working and that workplaces need to adapt accordingly. However, rather than acquiring specialized skills in one specific area, the demand in the digitized world is moving toward generalists—that is, people who have a strong understanding of a breadth of topics and disciplines while also specializing in a particular field. This change in demand is known as transdisciplinarity (IFTF 2011).

Rising average life expectancy, coupled with humans’ higher average lifetime productivity, will enable workers to take on a broader range of work opportunities, which will require more learning and training throughout their lifetime. In this context, institutions will be expected to provide training and up-skilling for workers choosing to change careers or gain new or different skills in order to remain competitive. In addition, organizations will be expected to invest in their employees, supporting them throughout a process of lifelong learning.

Although MENA’s education systems are largely considered outdated and traditional as compared with the needs of this constantly evolving global job market, up-skilling and other types of training can nonetheless offer a second chance for the region’s youth and adults who dropped out of school or did not complete their postsecondary education, and even for those whose skills are no longer relevant and must be updated. Because the range of skills that will be required for work will continue to evolve, workers will also be expected to adapt to this change. So far, there have been limited investments made to support lifelong learning across the region (UNESCO 2015), either

through the establishment of training institutions and informal education centers or by providing free access to up-skilling opportunities. This is due to the absence of a culture of learning that would instill a sense of curiosity and self-motivated learning beyond the classroom.

The second trend: More automation demands more creative workers

In their book *The Second Machine Age*, Brynjolfsson and McAfee (2014, 8) state, “Computers and other digital devices are doing for mental power . . . what the steam engine and its descendants did for muscle power.” The integration of machines and robots into our personal and professional lives is a reality. In this reality, humans must differentiate themselves based on their social and emotional intelligence, their ability to recognize patterns and make sense of the world, their flexibility, and, ultimately, their creativity.

In the context of the job market, technology has been both a destructive and creative force. As traditional jobs in the fields of transportation, logistics, manufacturing, construction, administration, and sales become increasingly automated, there will be a greater demand for roles that require skills such as “creativity, intuition, persuasion, and imaginative problem solving” (Kearney, Hershbein, and Boddy 2015, 4). This trend has been studied extensively by Autor, Levy, and Murnane (2003), who have observed the decline in routine and manual tasks as compared with nonroutine tasks, particularly those that are interactive or analytical, such as those in the fields of law, medicine, sales, and management. For example, in 2010 approximately 47 percent of jobs available in the U.S. and 35 percent of those in the U.K. were in time likely to become computerized. This was calculated by Nesta, a U.K. based charity, using a predictive model

which presents the probability of finding employment in a range of jobs based on their levels of creativity (Bakhshi, Frey, and Osborne 2015).

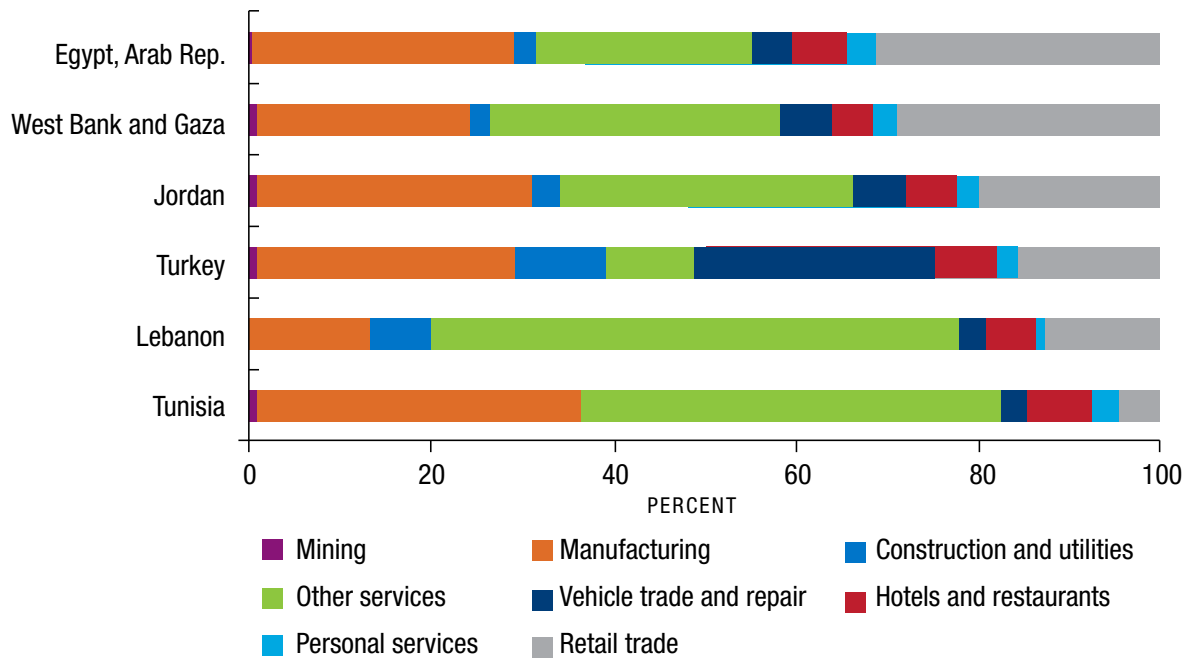
According to the model—which was replicated for both the U.S. and U.K., indicating similar results—jobs in education and community service, the arts and media, science and technology, and finance require the highest levels of creativity and therefore will remain in highest demand, but jobs in the service industry, transportation, construction and administrative support are likely to become obsolete with time. In other words, creativity is inversely related to computerizability—that is, the extent to which something can be done by a computer. However, in the most creative sectors, the introduction of new technologies is likely to promote “human-machine collaboration and codependence,” thus developing a new model for work (IFTF 2011, 3).

In the MENA region, the private sector is largely dominated by small businesses in low-productivity industries where much employment is informal. Beyond the agricultural sector, the sectors that dominate the labor market in most of the region’s countries include manufacturing, retail, and other basic services, as shown in figure 3. All these industries are expected to become more automated in the future, pointing to a need for greater investments in the more advanced and highly skilled scientific, financial, and arts sectors that are likely to provide greater opportunities for long-term employment and growth.

The third trend: The growth in big data and R&D requires stem education

In addition to the traditional uses of data to monitor and evaluate programs and gain a deeper understanding of customers’ needs, “big data” collected

Figure 3. Distribution of employment across nonagricultural sectors in the MENA region



Source: Census data; from Schiffbauer et al. (2015, 19).

by governments and international companies, are being used across sectors (including health, education, retail, public sector and technology) to conduct sentiment analysis, fraud detection, risk-modeling, data mining and other exercises (Manyika et al. 2011). All these allow for the collection and analysis of data, which can inform decisionmaking and help to develop smarter products and services.

Accordingly, with respect to the job market, the explosion of the data analytics field has seen a rise in demand for higher-order analytical skills, and for advanced digital literacy and strengths in science, technology, engineering, and math (STEM), in particular computer programming. At present, the region's literacy policies, as developed by UNESCO (Yousif 2009), are strictly focused on the provision of basic literacy (reading, writing, and numeracy) and life skills for individuals who are illiterate. But given the demands of big data, there is a need to expand the scope of these

programs beyond basic literacy and life skills to incorporate other relevant skills, such as digital literacy, as highlighted by industry leaders in the region.

However, these new skills must continue to be complemented with the basic literacy skills that have been emphasized to date. This is especially important in less developed countries such as Mauritania, Morocco, and Yemen, where female literacy rates (ages 15 and over) are still below 60 percent (UNESCO 2015). However, even in the remaining Arab states, English language fluency is lower than in most regions. Without mastering English, as highlighted earlier in the working paper, workers will be unable to communicate and contribute knowledge independently. For example, the top 10 programming languages in the world are in English, indicating that countries with populations lacking such skills, such as those in the MENA region, are likely to be excluded from developing a competitive advantage in fields that depend on it (English First 2015a).

On a national level, countries with better English skills are also associated with larger exports in advanced technology that depend on greater investments in research and development (R&D), such as in aerospace engineering, technology, pharmaceuticals, and the sciences. These countries are also known to invest a greater share of their gross domestic product (GDP) in these fields (English First 2015a). The MENA region has had one of the lowest levels of investment in R&D, with estimates that the oil-rich Gulf states spend less than 0.3 percent of their GDP on R&D, as compared with an OECD average of 2.26 percent (*The Economist* 2011). Of the countries for which data are available, only Tunisia and Morocco rank slightly above other countries at similar income levels in their R&D expenditures (Lanvin and Rodriguez-Montemayor 2015). However, with the growing presence of multinational companies in the region, trends indicate that investments are growing in biotechnology, pharmaceuticals, alternative energy, and other sciences. According to a survey conducted by *The Economist* (2011), 57 percent of interviewed companies stated that they plan to raise investments in the coming years. There are also a number of examples in academia and beyond that are positive indications of growing regional investments and innovation in science and technology. These include the King Abdullah University of Science and Technology Research and Technology Park, the Masdar Institute of Technology, and the Institute for Imagination and Ingenuity.

Although these initiatives are promising, they also need to be linked to students' educational experiences at the primary to tertiary school levels. Although the interest in STEM subjects is growing (International Institute of Education 2015), the quality of teaching and learning remains low, and students are rarely taught to develop research and analytical skills (*The Economist* 2011). Instead, they are expected to memorize

materials in order to pass examinations at critical junctures of their schooling experience. Further, most tertiary education institutions are teaching institutions, providing youth with few opportunities to get involved in research projects where they could gain an appreciation and understanding of scientific inquiry.

The fourth trend: Greater access to information makes media literacy critical

Another significant change is the rise of new forms of media that are changing the nature of communication, learning and our understanding of the world. With the rise of gaming, animation, and other forms of virtual networks, there has been a move toward more exchanges through computers, mobile devices, and other technologies that promote new models for collaboration and communication. These new models have fundamentally altered the types of skills that youth need to grow up learning.

Contrary to past generations that had to study reading, writing and arithmetic, Sugata Mitra at Newcastle University argues that three critical skills are taking the place of arithmetic (GOOD Magazine 2012). The first skill is reading comprehension, a traditional skill that will remain crucial for the members of the younger generation, who will likely do all their reading online. Second are information search and retrieval skills, whereby they will be able to seek and access all the information they need through the Internet. And third is the ability to distinguish truth from doctrine (GOOD Magazine 2012). As the amount of information that is publicly generated and accessible online continues to rise, with little oversight of its content, there is a concern that youth are and will continue to be exposed to information that could negatively influence their thinking if they are not armed with

critical thinking skills and the ability to determine the information's validity. This is a significant concern in a region like MENA, where education systems have not trained youth to think critically and question information that is shared with them. Moreover, the limited availability, production, and quality of Arabic content online makes these youth more susceptible to potentially harmful influences and practices than youth who also speak English.

The availability of new forms of information provides an opportunity for Arab youth to expand their horizons and engage in more sophisticated methods of communication that are still new to the MENA region, such as media literacy (ITU 2014). These forms of new media allow for more participatory engagement that is unrestricted by language, background, and geography, enabling individuals to freely interact and collaborate together globally. With companies expanding their operations internationally, business encounters via virtual communication methods are surpassing face-to-face meetings (World Economic Forum 2016). Workers must have the skills to clearly communicate and motivate teams virtually, using new tools such as cloud-based activities and platforms to promote engagement and collaboration.

The fifth trend: Increasingly interconnected work creates more flexibility and opportunity

As the nature of work is changing, so are the structures of organizations shifting toward being increasingly interconnected (World Bank 2016). They are also becoming more diverse, not only in their makeup but also in their operations. This, in turn, means that workers are expected to become more adaptable to changing environments, have an awareness of different cultures and know how to function and commu-

nicate effectively in virtual environments (ITFT 2011). This shifting work environment means that companies are able to provide workers with more flexibility to pursue a greater range of opportunities that are of interest to them through flexible hours or remote work. It also allows companies to draw on a range of expertise without incurring the additional costs of hiring full-time staff, a model that is seen as a win-win across many sectors, especially media and communications and information technology.

There is a rise of such small businesses in the Middle East. For example, Nabbesh (Arabic for "To Search") is an online skill exchange platform connecting Arab freelancing talent with global employers. Founded in 2012, Nabbesh connects people with skills in information technology, graphic design, and Arabic translation with short-term employment and projects for international employers, many times residing in the Gulf states. Freelancers include over 50,000 members with a wide range of skills, coming from over 100 cities across the region, and have access to over 6,000 freelance jobs. Similar initiatives are emerging in specific sectors or national contexts. For example, Qordoba is another platform that caters specifically to translators in the region, while Souktel, a start-up that develops customized mobile solutions to address social problems, is working with MIT to outsource work to youth in Palestine through their mobile phones using its interface, called JobMatch.

These changes in the nature of work have also created more jobs for workers who previously could not access traditional structured work environments, such as women who may not be able to leave their households to search for a job or those living in rural areas. In the context of the Middle East, this has offered new opportunities for youth and marginalized communities, such as refugees. One such example

is Natakallam (“We Speak”), an online platform that connects Syrian refugees in Lebanon with individuals looking to improve their Arabic, where the students improve their language skills while the Syrians earn an income. In this case, Syrians who do not have access to formal employment in their host countries are able to capitalize on their assets, allowing them to become self-sufficient and potentially support their families.

Finally, in the context of education, technology has also personalized learning by opening up the possibility for Arab youth to access free information and knowledge online, or to pursue new models of formal and informal learning online. For example, they can now enroll in massive open online courses (MOOCs).

These opportunities allow them to personalize the process based on their needs and interests and have flexibility in what, when, and how they study. More important, it promotes the model of lifelong learning, which allows workers to remain competitive and develop skills needed in the labor market.

The five trends discussed in this section present the changing nature of jobs and the skills and competencies that will be needed for workers from the MENA region to compete in the global economic market. These trends and their complementary skills are summarized in table 1. The next section considers how to reimagine youth learning and skills development in MENA through ed tech.

Table 1. The trends redefining learning and work and the skills arab youth need for their future

Trend	Skills
Lifelong learning	Adaptability Transdisciplinarity Self-motivation (to learn autonomously and continuously) Curiosity
Creative workers	Creativity Social and emotional intelligence Persuasion Problem solving
Data-driven decisionmaking	Analytical skills Digital literacy STEM Communication skills (English and Arabic)
Rise of new media	Virtual communication and engagement Critical thinking Media literacy (reading comprehension online, information search, identifying truth)
Interconnected world	Entrepreneurship High discipline Flexibility Cross-cultural competency

3. REIMAGINING YOUTH LEARNING AND SKILLS DEVELOPMENT IN MENA THROUGH ED TECH

As the changes brought about by the rise of digitization begin to permeate and make an impact on the world of work in the MENA region, the gap between the skills and competencies that youth currently learn in national education systems and those that will be needed in the future is going to grow. Addressing this divide will require us to broaden our definitions of education and learning and consider the role that technology can potentially play in supporting them.

On the basis of the six trends delineated in this working paper's previous section, this section presents six areas in education where ed tech initiatives are emerging as new and potentially complementary ways to reform education. These initiatives also place more agency in the hands of youth, especially over their learning, equipping them to become autonomous, lifelong learners—a skill essential to helping them move beyond the discourse of unemployment and disenfranchisement and into a future reimagined and redrawn by them.

The first initiative: Increasing access to a high-quality formal education

Countries across the MENA region have made great strides in recent decades in increasing access to formal education, with almost all children attending primary education in most countries. Djibouti, Mauritania, Yemen, and now Syria are exceptions, especially at the secondary school level, where enrollment rates drop to 27 to 47 percent (UNESCO 2015). However, even among other countries, fewer youth complete secondary education. In some countries,

like Egypt, due to the high population growth, it is expected that the governments will not be able to provide sufficient seats for all their students in the future and that those placed in schools will be studying in overcrowded classrooms.

This context places governments with limited budgets in a difficult position of being unable to effectively serve their populations, leaving youth with worse life and work prospects than previous generations. However, it also presents an opportunity for technology to complement the governments' efforts to scale up access to education.

At present, there are no recognized online initiatives working to increase access to formal education on a large scale. This is primarily because Arab governments do not recognize and accredit most online learning. However, a number of nonstate actors based in Egypt, Lebanon, and beyond have stepped in to offer this support nonformally. These models are particularly relevant and necessary in the region in light of the huge, growing numbers of Syrian and other refugee children—hundreds of thousands—who have been excluded from host countries' formal education systems. For example, Tabshoura is a recently launched free, interactive trilingual e-learning platform that intends to offer the complete Lebanese curriculum from kindergarten to grade 12. In addition to its goal of providing access to a high-quality education for sick children who are unable to attend school, it serves underprivileged children in overcrowded school settings, teachers interested in integrating technology and differentiated learning in their classrooms, and refugees lacking access to formal education. According to recent reports, another initiative is in place in Saudi Arabia to translate Khan Academy's videos and thus make them available to over 350 million people in the Arab world (Friedman 2015).

Case study 1: Nafham

Nafham (“We Understand”) is a free online K-12 educational video platform launched in Egypt in 2012, on which teachers and users can post 5- to 15-minute educational videos on any topic covered in the public school curriculum. The videos are compiled and curated by Nafham or posted by teachers, parents or students themselves as part of their Crowd-Teach initiative. According to Nafham, students who participate in teaching are found to perform the best, in part due to the process of learning while teaching. Videos are accessible through the website or its recently launched mobile application.

The initiative was first launched to address the gap between the high birthrate in Egypt and a government that was unable to accommodate the growing population of children in its schools fast enough to provide access to schooling for all. Nafham estimated that starting in 2012, about 1 million, and potentially more, children would be left out of school due to the lack of sufficient places. For those children in school, Nafham hoped to serve as an alternative to private tutoring, which is a widespread and lucrative industry costing Egyptian families \$2 billion to \$3 billion per year.

As of late 2015, the platform had 600,000 monthly active users with over 23,000 videos, 9,000 of which are based on original content, indicating the overwhelming demand for a new form of content to support children’s learning experiences both in and outside school. More than 65 percent of the users are based in Egypt, 15 percent are in Saudi Arabia and the remainder are in other Arab countries like Syria, Algeria, and Kuwait. Their data indicate that in Saudi Arabia, the second-largest market, viewers also include adult females, who likely did not complete their high school education. Although the videos posted have not been externally evaluated to ensure their accuracy or quality, this case shows technology’s potential to provide greater and more equitable access to educational content, supporting formal education on both the national and regional levels.

These initiatives alone may not increase access to formal education, but they represent a step in the direction of making high-quality learning more accessible to children and youth. They also place pressure on governments to respond more quickly and effectively to the needs of out-of-school students.

The second initiative: Using new media to improve teaching and learning, both inside and outside the classroom

Historically, learning in the classroom was determined both by the teacher and by the learning materials

that were provided as part of the national curriculum. Although the teacher in most developed countries continues to play a central role as the facilitator of learning who guides students in the process of discovery, classes in the Middle East remain teacher-centered, memorization based and assessment focused. Notwithstanding the substantial funds that have been invested in professional and curriculum development programs, only limited improvements in student outcomes have been observed, and students perceive what they are taught at school to be irrelevant and removed from their daily lives.

The rise of technological tools that can be used for educational purposes has opened up the space for students to play more active roles in the learning process. For example blogs and wikis, as well as social software and websites such as Skype and YouTube, make it easier for students to exchange knowledge, collaborate, create and engage in experiential learning that connects to the real world. In addition to developing their academic and communication skills, connecting online with others around the world promotes a diversity of opinions, cultures, and belief systems, which increases cross-cultural competency, social intelligence and virtual collaboration (IFTF 2011).

Technology also allows the learning process to be more customized to the needs of students through differentiated learning. Teachers can now access a wide variety of teaching materials, including new media to complement the core curricula, such as video clips, interactive games, flipped classrooms and cloud-based platforms for sharing and developing content.

On a broader institutional level, technology also has the potential to improve the efficiency and effectiveness of internal management systems within schools and universities. This, in turn, allows teachers and faculty to spend more time focusing on what happens in the classroom. For example, the rise of cloud-based learning management systems used by educational institutions across all stages has made the collection, management, sharing, and exchange of data more organized. It has also made real-time collaboration and communication more widely available for all stakeholders.

During the past decade, there has also been a global trend toward the integration of physical technologies in the classroom, such as tablets, interactive whiteboards and laptops, arguably to accelerate the learning process. The first such initiative in the MENA region was

the Jordan Education Initiative (JEI), discussed below in the case study. More recently, in 2012, the government of the United Arab Emirates (UAE) launched the Mohammad Bin Rashid Smart Learning Program, the most ambitious effort in the region, which aims to integrate technology across most of the country's public schools, giving students from grades 6 to 12 their own tablets. Although it is still too early to determine its impact, other Gulf countries have already expressed interest in implementing similar programs in the near future, with the hope that such steps will better prepare their students for the knowledge economy.

Ideally, however, these initiatives would not be limited to inside the classroom. More initiatives—such as the innovative social enterprise effort called LRNG, pioneered by the MacArthur Foundation in the United States—are needed to broaden the definition of learning to recognize the valuable learning that takes place in multiple settings. LRNG attempts to overcome the emphasis on outcomes and certificates as a definition of success and thus acknowledges informal learning outside the classroom. It forms partnerships with schools, businesses, cities, and community centers to promote networked learning. Students identify their interests on a platform, which then suggests relevant learning experiences, resources, and events to them through its network of collaborators, based on which students collect digital badges to signify the skills, interests, and achievements that they earn. This process also allows them to gain a broader variety of experiences at an early age that will make them more attractive to potential employers and will allow them to market these skills more easily through the platform. An initiative like LRNG in MENA would be extremely valuable in providing more opportunities for learning and recognizing nonformal learning, especially for the most vulnerable youth who do not have the means to pay for formal education and training.

Case study 2: Jordan education initiative

Launched at the World Economic Forum in 2003, the Jordan Education Initiative (JEI) was the first educational public-private partnership established in the MENA region. Through partnerships with key global and local actors in the fields of technology and education, one of its goals was to integrate ICT in schools to improve students' outcomes and capabilities and better prepare them for the knowledge economy. JEI was piloted in 100 schools with the aim of then rolling out the model across the country and replicating it internationally (JEI 2004). Although the former did not take place, JEI has since broadened its scope, working in more schools across the country in partnership with Madrasati, another local nongovernmental organization (JEI 2013).

JEI's model involves improving schools' ICT readiness through the provision of hardware and software, training for teachers and school leaders, change management, and digitized content and enrichment materials to improve student learning. With its partners, JEI pilots a range of various programs, applications, and games across K-12, focusing on English and Arabic literacy, math and sciences, computer programming, critical thinking, and other soft skills.

Although the reach of JEI has been limited and its impact on student outcomes has been small (Alnoaimi 2011), it has succeeded in changing the culture in some schools, resulting in more student-centered practices, innovative teaching methods and improved leaderships skills for school principals (USAID 2008). More important, JEI is an example of a technology-driven initiative that fills a gap that the Ministry of Education has so far been unable to fill itself.

The third initiative: Preparing learners for the jobs of the future

The emphasis among educators and governments in recent years has been on promoting the STEM subjects, which are known to be the most competitive and highly demanded fields in the job market. The MENA region is currently graduating only about 23 percent Arab youth from these fields, a rate that is lower than those in other developing countries. Although some countries like Saudi Arabia and Tunisia produced between 20 to 25 percent STEM graduates in 2012, the STEM rate was at or below 10 percent in Algeria, Qatar, the UAE, and Lebanon (Lanvin and Rodriguez-Montemayor 2015).

Although investments in scientists, researchers, engineers, and mathematicians are necessary, there is

also a growing movement to couple the emphasis on STEM with an emphasis on the creative fields of the arts. Schools in the MENA region typically stream students at the secondary level into either of the two programs, creating a perception that the arts are easier and less important. In fact, the use of courses in new media, experiential learning and multidisciplinary learning that marry both the arts and sciences are designed to promote better and more relevant learning for students (Bakhshi, Frey, and Osborne 2015). This trend, known as STEAM, represents the incorporation of the arts' "A" into the core group of STEM subjects. Such programs are also believed to more effectively develop a range of skills that are in demand among employers, such as collaboration, creativity, flexibility, and more (IFTF 2011).

In addition to strengthening the technical skills of students, the area that all interviewed industry leaders agreed is the most critical for future workers in the MENA region is for youth to have strong communication skills in Arabic and even more so in English. At present, graduates are weak in either or both languages, which limits their ability to perform effectively and professionally at work. As organizations extend their reach beyond the region and businesses become more international, youth will need these skills to remain competitive. One way in which these skills can be strengthened is through the use of technological tools to develop more creative, engaging, and personalized mobile and web applications for learning languages.

In Jordan alone, there are at least three examples of such technological tools, among many others. The first example is Little Thinking Minds, an interactive digital Arabic literacy program for young learners accessible via digital books and mobile applications. The second is AlHudHod, a program for early learners that is taught using smartphones and interactive boards, facilitating Arabic literacy and teaching numeracy in ways that promote imagination and creativity. The third, Ben and Izzy, is a widely known 3-D animated television series program developed by Rubicon, a leading media company. Although it primarily serves as entertainment, it also teaches children to develop tolerance, cross-cultural understanding and open-mindedness as it follows the lives of two friends from Jordan and the United States.

Case study 3: The rise of computer programming in the MENA region

As technologies have become more affordable, computer programming has grown in popularity across schools in parts of the MENA region, like Lebanon, Jordan, the UAE, and Kuwait (Knight 2015). Although North Africa has not seen as much activity in this regard, Egypt, Tunisia, and Morocco participated in Africa Code Week early in 2015, an initiative to encourage coding among all students. These programs are also now being offered in refugee camps. One notable program is RebootKamp, a pilot project for Syrian refugee youth in Jordan launched by a nongovernmental organization from Silicon Valley. It offers technical training in coding and digital tools followed by employment for its graduates. If successful, the program will be deployed for refugees in other countries and contexts in the region and beyond.

UNICEF is implementing another program serving younger Syrian refugee children in Lebanon using a low-cost computer called Raspberry Pi, developed by the University of Cambridge's Computer Laboratory. This program teaches children software coding by enabling them to develop their own games, in the process raising their interest in the STEM fields. This model uses Scratch, a visual programming platform developed by MIT's Media Lab). Scratch is also being used to teach coding to young Emirati students in public schools in Abu Dhabi, where its second cohort consisted of over 220 students from 50 schools (Wakalat Anba'a al-Emarat 2015). Another government-led program in the UAE, Computer Science First, was just launched in partnership with Google to offer the same skills to over 250,000 children in both public and private schools (Pennington 2015).

Other similar private initiatives have also been launched, such as the Coding Circle (UAE), Hello World Kids (Jordan), and Coded (Kuwait), which offer software coding courses to a variety of ages of children and youth. Although the Jordanian initiative has established a partnership with the Jordan Education Initiative to provide these programs to some public school children, for the most part these opportunities are out of reach for students from low- or middle-income backgrounds due to their relatively high cost.

Another skill that is critical to develop among the next generation of youth is digital literacy. Because workers' futures are intertwined with those of computers and other technologies, there is a demand for individuals who are no longer just proficient in how to use these technologies but who are also fluent in programming. This has seen the rise of software coding programs at all stages of education and at various levels of sophistication. To address these needs, new hardware and software technologies have been developed to support this process, and organizations are being established specifically to address this growing demand across the region.

The fourth initiative: Using big data to align learning with the job market

As information becomes digitized, accessing and integrating it across government agencies provides more comprehensive data and allows for more effective decisionmaking based on evidence. Although this may be taking place in the context of individual organizations, the use of big data on a larger scale can provide governments and other relevant stakeholders with valuable information about the impact of implemented interventions, the challenges faced and how solutions can be tailored to different segments of the population (Manyika et al. 2011).

This innovative model was implemented by the German Federal Labor Agency, which helps to find work for the unemployed and offers them counseling and support services through various agencies and centers around the country. By using big data, the agency was able to provide more customized services, reducing the time spent to find a job and saving up to \$15 billion annually. In addition, the country was able to reduce unemployment from 4.4 million to 3.2 million between 2003 and 2010 (Manyika et al. 2011).

In the context of education, big data can be shared among policymakers, education institutions, and industry leaders as they collectively develop policies and programs aligned with the needs of the job market that will thus ease the transition for youth from education to work. This trend is still nascent in the MENA region, with few governments having the expertise needed to collect and analyze such data. However, given the high unemployment rates of youth in the region, technology could be used to leverage such data in creating medium- to long-term strategies to provide youth with better work prospects. This applies across all sectors, including vocational education, a sector that is often overlooked in MENA.

In leading countries like Germany and the UK, vocational education is increasingly powered by R&D and is closely linked to both academia and industry. It also is integrated with apprenticeship programs that offer employment opportunities, and even higher-level studies, making for an attractive and highly selective alternative to traditional forms of education. Uptake is seen in the automotive industry, media and communications, manufacturing, technology, and the like. For example, Rolls Royce, Jaguar Land Rover, the BBC, and Barclays are all working with local research universities in the U.K. to co-design courses at the university level (both undergraduate and postgraduate), offering both technical and theoretical knowledge, as well as international work experience, that will arm youth with the same skills and salaries that are offered to students in traditional university programs. In fact, Barclays has found that its apprentices are outperforming graduates who entered from universities and are now serving as mentors for new trainees (Burnett and Thrift 2015).

MENA is trailing behind in using technology to advance vocational education and to better prepare youth for the demand for certified workers in fields

such as health, technology and education. One example from the region illustrating how job growth projections could help to circumvent the current large skills gap is the state of the technology sector. In 2012, the skills gap for jobs based on information technology in Saudi Arabia was 73 percent, which is equivalent to 17,736 jobs when calculated as a proportion of total demand. Similarly, the gap was about 32 percent in the UAE (or approximately 5,240 jobs). It is estimated that by 2016, these rates are likely to grow to 79.4 percent (33,792 jobs) and 47.8 percent (15,386 jobs), respectively (Lanvin and Rodriguez-Montemayor 2015). Given the size of these gaps and the length of time it takes to train workers for employment in these fields, it is likely that this gap will widen in the short term, leaving a large number of unemployed youth who are not sufficiently trained to fill these positions. Doroob, a new initiative in Saudi Arabia (see below), offers up-skilling and training opportunities based on the needs of the job market. Although it is too early to judge the impact of Doroob, initiatives as such, modeled after the success of Germany, could be an important step toward bridging the skills gap for youth in the Arab world.

The fifth initiative: Adopting ongoing metrics and performance analytics for assessing and personalizing learning

The use of data and analytics can improve communication, transparency, and accountability at the institutional level, which in turn can improve the efficiency and relevance of decisionmaking. More important, it can help administrators and teachers to monitor students regularly and provide opportunities for preemptive remediation if they are falling behind or at risk of being retained. In the context of the classroom, technology can also be used to provide formative assessments to ensure that students and teachers identify learning gaps in real time. As a result, it offers teachers the flexibility to alter online content or incorporate new innovative materials and programs that provide personalized support to address the specific learning needs of students at various academic levels.

In the U.S., for example, it was recently announced that a number of universities will further refine their

Case Study 4: Doroob

Doroob is a national initiative launched in early 2015 by the Human Resources Development Fund in Saudi Arabia. It was established to bridge the growing gap between the high unemployment rate of Saudi youth, estimated at about 30 percent (not including those who are not in employment, education or training) and the needs of employers, as well as the demands of the country's labor market.

Doroob offers a range of free online accredited professional development certificates to upskill workers at three levels: (1) career readiness (ICT and English language classes), (2) job-specific training (in hospitality, accounting, retail, information technology, fashion, and more) and (3) on-the-job training. The initiative will offer both online and blended learning opportunities at vocational colleges across the country, with plans to raise the student capacity from 100,000 to 400,000 by 2016 (Leicestershire Textiles Hub 2015).

Although it is too early to determine Doroob's impact, this case presents a unique effort, the goals of which are integrated with the national qualification framework. By forming partnerships with employers, it can also develop programs catered to meet their needs in the future and it can offer up-skilling in areas and sectors that have been identified as growing industries in the country.

academic programs, turning some of them into more personalized blended learning models. In these programs, the content will be customized to the needs of every student based on data that are collected on their progression throughout the semesters (Wexler 2015).

Although the MENA region still has a long way to go to achieve this level of personalization, there is a growing investment in learning management systems—online platforms for administering, documenting, tracking, reporting, and communication within schools and universities. These platforms allow, among other things, for more efficient and effective monitoring of

students. They can also be further developed to shift emphasis from assessment focused on outcomes to a focus on learning and the mastery of concepts. This must be coupled with training for teachers and faculty on how to use these technologies to improve teaching and learning practices in the classroom. In the context of the MENA region, where there is a tendency for some teachers to inflate students' grades or allow them to transition to the next grades without mastering the learning outcomes for that year, the use of such assessments would ensure greater accountability and monitoring of student progress.

Case study 5: edX blended learning classes

Following MIT and Harvard's success in launching edX as a leading provider of MOOCs through its online platform, MIT has begun trials of some courses in blended learning forms. Working with schools and universities around the world, it is studying the impact of these new models of learning on student outcomes. What differentiates these courses is not the availability of online videos but the innovative tools that are integrated with the courses to offer students a more personalized and engaging learning experience.

According to a preliminary study of a circuits and electronics course offered at San Jose State University, significant improvements were observed following the introduction of the blended model, with a decline in student failure rates from 41 percent to 9 percent (Agarwal 2014). This, according to Agarwal (2014), was due to the following set of features that were introduced to the course:

1. **Active learning:** Shifting away from teacher-led lectures to watching short video tutorials followed by interactive exercises allows students to practice concepts as soon as they are taught.
2. **Self-pacing:** Students can cover the materials at their own pace, focusing on areas of difficulty or going ahead in sections that they mastered already.
3. **Instant feedback:** As assessment is integrated into the technology, students get their results instantly, allowing them to correct their mistakes and in the process ensuring that they master all concepts before going ahead to new ones.
4. **Gamification:** Interactive games allow students to build online labs, encouraging them to be creative.
5. **Peer learning:** The introduction of online discussion forums and peer assessments allows students to be at the center of the learning experience with teachers serving as facilitators of the process. In fact, students state that they learn more by teaching and supporting each other.

An evaluation of a chemistry course found similarly significant improvements following the introduction of online assessment tools (instead of homework or final exams), with students performing on average four times better than in the previous (Cima 2014).² Further studies will need to be conducted in order to generalize these findings to other courses and classroom settings. However, the two cases provide strong evidence in support of student-led, interactive, and blended learning models.

The sixth initiative: Promoting lifelong learning and skills development through open online and blended learning

As discussed earlier in the working paper, the nature of work is shifting. Working lives will be longer and jobs will be more advanced and require a range of new skills and competencies. Thus, there will be a greater demand for lifelong learning opportunities, including up-skilling and on-the-job training. These concepts are still new in the region, and few organizations focus on offering individuals who drop out of school or do not complete their education a second chance to gain new and more relevant skills for employment. However, as work becomes more transdisciplinary and people are expected to up-skill at numerous points in their career, students must no longer be viewed as passive receptacles of knowledge but rather as active, curious, and self-motivated learners.

This shift can be facilitated using technology, which has brought about new models of learning that provide greater and potentially more equitable access to education than traditional educational institutions. The most dominant model, open educational resources, has redefined learning at the secondary and tertiary levels from being restricted to the school and classroom to one where students can learn for free anywhere, anytime and based on their specific needs

and interests. It has also allowed for wider participation in education, particularly among marginalized groups, such as refugees, out of school youth, and adults. The last decade has witnessed a rapid expansion of the availability of open educational resources, including the proliferation of MOOCs at the tertiary level, offered by leading universities around the world through platforms such as Coursera and edX. Although the courses cumulatively do not contribute to a university degree, students do receive certificates of completion after each course.

However, one new model that MIT launched earlier this year presents a potential alternative path to graduate studies through a micromaster's program with "inverted admission." In other words, students can gain a credential after successfully completing (with high scores) a semester's worth of online courses through edX, based on which they can get accepted into the master's program at MIT and complete the final semester at the university (MIT 2015). This program also gives students the flexibility to complete the first series of courses online.

The model of MOOCs has migrated to the MENA region in recent years through platforms such as Edraak (Jordan), described below, and Rwaq (Saudi Arabia), two Arabic MOOC platforms that offer courses in a range of academic and professional fields. Other initiatives have also been launched at the primary and

² The assessment allowed students to repeat the tests as many times as needed within two weeks to ensure that they were able to master the material.

secondary levels, first in the West, with models like Khan Academy, which provides short, free online video tutorials on all subjects in the U.S. curriculum. More recently, similar models have sprung up in the region, such as Nafham, Tahrir Academy (also from Egypt), and Tabshoura, all of which complement the national curricula in their respective countries by providing lessons using online media.

A more recent alternative to online learning is the blended learning model, which offers an opportunity for students to both study flexibly online, but also in a physical space with a facilitator and classmates, where they get regular support. This model is increasingly seen as more effective than both online learning and bricks-and-mortar education, particularly in

inaccessible, high-poverty, or conflict-ridden contexts (Means et al. 2013).

Notwithstanding the benefits of these new learning models, particularly in providing access to and flexibility of learning for youth in difficult contexts, the most significant concerns are the lack of quality assurance and, in most cases, accreditation that would allow students to gain recognition for their learning from governments and potential employers in the region, many of whom do not yet acknowledge online learning. This, in part, can be attributed to the prevalence of fake online certificates, offered by diploma mills or fraudulent online universities, at least 180 of which are based in the region (Farooqi 2014; Plackett 2015).

Case Study 6: Edraak

Edraak, an initiative of the Queen Rania Foundation for Education and Development, is the first Arabic-language platform for MOOCs. It was launched in 2014 using technology developed by the Harvard-MIT consortium, edX, to provide free access to courses taught by professors from top regional and international universities. It is also collaborating with local universities to create courses with local content.

Edraak has so far offered 29 courses in a range of academic fields such as physics, energy, health, education, and design, as well as skill-based subjects like entrepreneurship, financial literacy, résumé writing, and the English language. Since its launch, the portal has attracted over 429,000 registered learners, illustrating the high demand, largely among youth, for free and flexible models of learning. In particular, there is an evident hunger for skills development at the postsecondary level in a range of subjects that are not typically accessible in the Arabic language. Although only about 5 percent of registered learners complete the courses, these rates are similar to those for other online education platforms.

Although students who complete Edraak courses receive a certificate of mastery, as in the case of other MOOCs, the courses are not formally recognized by governments; nor do they lead to degrees. However, through its partnerships with the private sector and other sponsors of courses, Edraak offers some courses that address the needs identified by its partners.

4. RECOMMENDATIONS FOR HOW TECHNOLOGY CAN HELP CLOSE THE SKILLS GAP IN MENA

This working paper has presented the case for developing an educational ecosystem in the MENA region that better prepares youth for the changing nature of work and the jobs of the future.

Ed tech initiatives can be pursued alongside necessary education reforms to accelerate progress in education and address the youth skills crisis. These initiatives will not succeed as one-time efforts and do not negate the necessity of investing in the pillars of a good-quality education, including qualified teachers and more equitable access. However, they could contribute to the sea of change needed to leapfrog educational advances in the region.

The 10 recommendations offered here provide some insights into the conclusions drawn from the many insights shared by experts and the literature reviewed for this working paper. Although they are not meant to be comprehensive, it is hoped that they will be helpful in providing some initial guidance for future investment in ed tech, looking to address the youth learning and skills gap in MENA.

1. New initiatives must address the learning needs and contexts of Arab youth.

Given the unique makeup of the region and its complex educational and employment challenges for youth, it is critical to invest in technology initiatives that are homegrown or are developed to carefully address the specific needs of the region, rather than being simply imported from other contexts. To do so requires greater coordination and collaboration across government, educational institutions, industry, and civil

society to identify innovative and scalable solutions that will tackle the weaknesses of the education systems, and the high rates of unemployment in the region.

2. To create a sea change, initiatives must reach the most underserved youth.

As a recent Harvard report concluded, the MOOCs offered in the United States between 2012 and 2014 largely benefited students from more-affluent and better-educated neighborhoods (Hansen and Reich 2015). For ed tech investments in MENA to benefit the most underserved youth, such as refugees and rural youth, they must address critical factors, such as poor connectivity, low English proficiency and the prohibitive costs of such opportunities.

3. Invest in R&D and STEAM education.

Traditional education reform and investments in ed tech must be coupled with greater investments in R&D and STEAM education. R&D has been associated with science and innovation and is a key factor in driving the competitiveness of countries on a global scale. These investments are critical for developing new and competitive industries, for generating more jobs and creating the demand for a higher caliber of students and workers who have the most highly demanded skills in the workplace, and for establishing a culture of lifelong learning. At the same time, governments must invest in STEAM programs across secondary and higher education and integrate programs and activities across the curriculum. These programs have been deemed most effective when using a model of experiential learning, where students are actively engaged in the learning process and their activities draw on real life scenarios that are relevant to their daily experiences.

4. Align ed tech investments with national qualification frameworks.

To reap the benefits of ed tech investments in the Arab world, they must be more closely aligned with the national qualifications framework of every country. These frameworks should guide the development of digital courses and degrees by clearly identifying the jobs needed in the medium to long term and the skills required by each industry. This requires collecting and analyzing large data sets on education and the job market to support evidence-based decisionmaking. This process can improve the alignment across stakeholders and industries and thus can reduce the high unemployment rate of youth in the region. Countries like the UAE have such a framework and could help inform the process in other countries in the region. The challenge, however, will be to ensure that education institutions and ed tech investments are aligned with and recognized by governments.

5. Governments must create clear accreditation procedures for digital learning.

Recognition and accreditation by government bodies is essential to encouraging greater investment in ed tech and in guiding students to make good choices in selecting digital learning opportunities. Both institutions and students would benefit from clearer standards and procedures regarding the accreditation of online learning. Recognition should not, however, be limited to formal education. Nonformal education—provided, for example, through online platforms or mobile devices—could be valuable in complementing government-delivered or -regulated formal education and result in improving learning outcomes.

6. Provide blended learning models in partnership between Western and Arab-based education institutions.

The ed tech field is developing rapidly and is opening up new learning opportunities for all learners around the world. Education institutions in the MENA region risk falling behind by not engaging in the online education world. At the same time, education institutions with a mandate to increase access to their courses globally are seeking partners that would give them access to the Arab world and enable them to provide support to its learners. Blended learning models built on partnerships between Western institutions with experience in online learning and Arab universities committed to broadening the learning opportunities for their students could be an excellent starting point. Blended learning models such as edX also provide a strong case for real-time assessment and differentiated learning for students.

7. Offer greater incentives for females to join the labor force.

The average youth female unemployment rate in the MENA region is almost two times higher than that of men, at about 46 percent in 2014, illustrating a wide gap in labor force participation between men and women. In addition, many women choose not to join the labor market or exit early due to family obligations, a lack of availability of flexible employment options or other reasons. Although more women than ever are now setting up their own businesses, their numbers are still small. Despite being increasingly more educated than their male counterparts, young women are in need of greater incentives to join the labor force, through the provision of more flexible work arrangements, more equitable salary packages and work conditions, and targeted opportunities for training or up-skilling. Ed tech can, among other things, provide women with better access to job opportunities through female-only online

platforms such as Glowork or by offering flexible online training programs, which will ensure that they continue to learn and remain productive.

8. Use technology to foster collaboration and the exchange of ideas across schools and teachers in the region.

Given that teachers are known to have a strong and significant impact on student learning outcomes, the low quality of teaching in the region remains one of the largest challenges to improving education there. In light of the limited quality of teacher training institutions and professional development programs for raising these standards, technology could provide large-scale access to informal teaching support through an online community of educators who can share and exchange their lesson plans, teaching materials and effective student-centered teaching practices with each other. It could also encourage a culture of collaboration and mentoring, which is largely absent from the region's schools. So far, no such regional efforts exist; however, one example outside the region is Better Lesson, based in the U.S. It is an online portal that curates and shares the most innovative teaching materials and practices from the top-performing teachers around the country. In the context of the MENA region, this could be applied to subjects such as math, science and English, the curricula for which are similar across all countries and which could benefit greatly from pooled resources.

9. Support the creation of high-quality Arabic content accessible to underserved youth.

English language fluency is creating a wider wedge between the educated and less or not educated Arabs in the region. Although the former are increasingly

contributing to content generation in English, the latter are left to access the limited and low-quality Arabic content available online. With most educational institutions and workplaces in the region favoring fluency in English over Arabic, there has been a decline in investment, interest, and skills to create Arabic content across the region. A number of recent initiatives have been attempting to address this weakness by translating online content from Arabic into English. These include the "Arabic Collections Online," a program led by a consortium of Arab universities to digitize over 15,000 Arabic books (Al Bustani 2014); and Aliqtisadi's translation of the *Harvard Business Review's* expert advice section online (Twofour54 2013). Despite these laudable efforts, more investment at a regional level is needed to enrich Arabic content online in order to provide higher-quality content to the majority who are not fluent in English.

10. Develop innovative and sustainable financing models for ed tech initiatives.

In the Arab region, philanthropy, and small-scale venture capital are playing an important role in seeding online learning. Numerous initiatives, however, have not been able to sustain themselves financially or continue to struggle. Although demand from students and their willingness to pay for a high-quality digital education may play a big role in the financial sustainability of these initiatives in the future, more sustainable financial models should be explored to support and encourage more ed tech initiatives that target underserved youth in the region. Pioneers in online learning, such as Harvard and MIT's edX, are looking to become self-sustaining; but at the same time, both institutions are setting up more selective, fee-based online courses that are intended to be more sustainable. Similar models should be explored in the MENA region.

REFERENCES

- Agarwal, A. 2014. "Anant Agarwal Ted Talk 2013: Why MOOCs Still Matter." Online video clip, YouTube, <https://www.youtube.com/watch?v=f-nOi2v87woU>.
- Ahmed, M., D. Guillaume, and D. Fuceri. 2012. *Youth Unemployment in the MENA Region: Determinants and Challenges*. Washington: International Monetary Fund. <https://www.imf.org/external/np/vc/2012/061312.htm>.
- Al Bustani, H. 2014. "New York University Abu Dhabi Digitises Arabic Books for Worldwide Access." *The National*. <http://www.thenational.ae/arts-life-style/the-review/new-york-university-abu-dhabi-digitises-arabic-books-for-worldwide-access>.
- Alnoaimi, T. 2011. "Case Study: Jordan." In *Transforming Education: The Power of ICT Policies*, ed UNESCO. Paris: UNESCO.
- ASDA'A Burson-Marsteller. 2015. "7th Annual ASDA'A Burson-Marsteller Arab Youth Survey 2015."
- Autor, D. H., F. Levy, and R. J. Murnane. 2003. "The Skills Content of Recent Technological Change: An Empirical Exploration." *Quarterly Journal of Economics* 118, no. 4: 1279-1333.
- Awad, N. 2015. "Edraak: Expanding Access to Education for Arab Youth Online." Stepfeed. <https://stepfeed.com/more-categories/big-news/edraak-expanding-access-education-arab-youth-online/#.VmE542QrK2w>.
- Bakhshi, H., C. B. Frey, and M. Osborne. 2015. *Creativity vs. Robots: The Creative Economy and the Future of Employment*. London: Nesta.
- Bardak, U., H. Huitfield, and J. Wahba. 2006. *Employment Policy Reforms in the Middle East and North Africa*. Turin: European Training Foundation.
- Bayt. 2015. "The Bayt.com Middle East Job Index Survey." http://img.b8cdn.com/images/uploads/article_docs/bayt-com-ji-survey_feb-2015_final_24002_EN.pdf.
- Bet, G., J. Cristia, and P. Ibararán. 2014. *The Effects of Shared School Technology Access on Students' Digital Skills in Peru*. Washington: Inter-American Development Bank.
- Brookings. 2014. *The Arab World Learning Barometer*. Washington: Brookings Institution. <http://www.brookings.edu/research/interactives/2014/arab-world-learning-barometer>.
- Brynjolfsson, E., and A. McAfee. 2014. *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. New York: W. W. Norton.
- Burnett, K., and N. Thrift. 2015. *The Future of Higher Vocational Education*. Sheffield and Warwick: University of Sheffield and University of Warwick.
- Castells, M. 2011. *The Rise of the Network Society: The Information Age—Economy, Society, and Culture, Volume 1*. New York: John Wiley & Sons.
- Cima, M. 2014. *A mastery-based learning and assessment model applied to 3.091r (Introduction to Solid-State Chemistry)*. 3.091r Report March 2014, MIT. <http://web.mit.edu/3.091x/www/3091r%20Final%20report.pdf>.

- Cristia, J., A. Czerwonko, and P. Garofalo. 2014. *Does Technology in Schools Affect Repetition, Dropout, and Enrollment? Evidence from Peru*. Washington: Inter-American Development Bank.
- Dhillon, N. 2008. *The Middle East Youth Bulge: Challenge or Opportunity?* Washington: Brookings Institution.
- The Economist. 2011. *Laying the Foundations: A New Era for R&D in the Middle East*. A report from the Economist Intelligence Unit. http://www.economistinsights.com/sites/default/files/downloads/EIU-ATIC_Report1_Web.pdf.
- Education for Employment. 2014. *Challenges and Opportunities for Youth Employment in the Middle East and North Africa*. Washington: Education for Employment.
- English First. 2015a. "English and Innovation." In *English First Proficiency Index 2015*. <http://www.ef.com/epi/insights/english-and-innovation/>.
- . 2015b. "Middle East and North Africa." In *English First Proficiency Index 2015*. <http://www.ef.com/epi/regions/middle-east-and-africa/>.
- Farooqi, M. 2014. "Online Fake Degrees: Xpress investigates." *Gulf News*. <http://gulfnews.com/news/uae/education/online-fake-degrees-xpress-investigates-1.1342936>.
- Friedman, T. 2015. "Letter from Saudi Arabia." *New York Times*, November 24. http://www.nytimes.com/2015/11/25/opinion/letter-from-saudi-arabia.html?_r=0.
- Goldin, N., M. Hobson, P. Glick, M. Lundberg, and S. Puerto. 2015. *Toward Solutions for Youth Employment: A Baseline for 2015*. Washington: Solutions for Youth Employment.
- GOOD Magazine*. 2012. "Future Learning Mini Documentary." Online video clip, YouTube. https://www.youtube.com/watch?v=qC_T9ePzANg.
- Hansen, J. D., and J. Reich. 2015. "Democratizing Education? Examining Access and Usage Patterns in Massive Open Online Courses." *Science* 350, no. 6265: 1245-48.
- IFTF (Institute for the Future for the University of Phoenix). 2011. *Future Work Skills 2020*. Palo Alto, Calif.: IFTF.
- ILO (International Labor Organization). 2015a. *Global Employment Trends for Youth 2015: Scaling Up Investments for Decent jobs for Youth*. Geneva: ILO.
- . 2015b. ILOSTAT Database. Geneva: ILO.
- International Institute of Education. 2015. *Open Doors 2015: Report on International Educational Exchange*. New York: International Institute of Education.
- ITU (International Telecommunication Union). 2014. *Digital Opportunities: Innovative ICT Solutions for Youth Employment*. http://www.itu.int/en/ITU-D/Digital-Inclusion/Youth-and-Children/Documents/YouthReport_2014.pdf.
- JEI (Jordan Education Initiative). 2004. *The Jordan Education Initiative: A Public-Private Partnership Model for Effective and Advanced Learning Deployment*. Amman: JEI.
- . 2013. *Jordan Education Initiative Annual Report 2013*. Amman: JEI.
- Kearney, M. S., B. Hershbein, and D. Boddy. 2015. *The Future of Work in the Age of the Machine: A Hamilton Project Framing Paper*. Washington: Brookings Institution.

- Knight, L. 2015. "Get Your Code On in the MENA." WAMDA. <http://www.wamda.com/2015/08/get-your-code-on-in-the-mena>.
- Lanvin, B., and E. Rodriguez-Montemayor. 2015. "Re-Dynamizing the Job Machine: Technology-Driven Transformation of Labor Markets in MENA." <http://global-indices.insead.edu/rp/>.
- Leicestershire Textiles Hub. 2015. "Leading U.K. Training Provider Launches Nation-wide Skill Development Programme for Saudi Youth." <http://www.leicestershiretextileshub.co.uk/news/leading-uk-training-provider-launches-nation-wide-skill-development-programme-saudi-youth>.
- Manyika, J., M. Chui, B. Brown, J. Bughin, R. Dobbs, C. Roxburgh, and A. H. Byers. 2011. *Big Data: The Next Frontier for Innovation, Competition, and Productivity*. New York: McKinsey & Company.
- Martin, M. O., I. V. S. Mullis, P. Foy, and A. Arora. 2012. *TIMSS 2011 International Results in Science*. Boston: International Association for the Evaluation of Educational Achievement.
- Means, B., Y. Toyama, R. Murphy, and M. Baki. 2013. "The Effectiveness of Online and Blended Learning: A Meta-Analysis of the Empirical Literature." *Teachers College Record* 115, no. 3: 1-47.
- MIT (Massachusetts Institute of Technology). 2015. "FAQ's on MIT's New Path to a Master's Degree: Pilot Program Reimagines Admissions Process, Introduces 'MicroMaster's.'" *MIT News*, October 7. <http://news.mit.edu/2015/faqs-mit-new-path-masters-degree-micromasters-1007>.
- Moreau, M. 2015. "Middle East Sees Rise of Startup Incubators." Global Risk Insights. <http://global-riskinsights.com/2015/03/middle-east-sees-rise-of-start-up-incubators/>.
- OECD (Organization for Economic Cooperation and Development). 2014. *PISA 2012 Results in Focus: What 15-Year-Olds Know and What They Can Do with What They Know*. Paris: OECD.
- . 2015. *Students, Computers, and Learning: Making the Connection*. Paris: OECD.
- Pennington, R. 2015. "ADEC and Google Join Forces to Educate Children about Coding." *The National*. <http://www.thenational.ae/uae/education/adec-and-google-join-forces-to-educate-children-about-coding>.
- Plackett, B. 2015. "A Web of 'Diploma Mills' Plays on Arab and Western Students Alike." Al-Fanar Media. <http://www.al-fanarmedia.org/2015/02/web-diploma-mills-preys-arab-western-students-alike/>.
- Ridge, N. 2014. *Education and the Reverse Gender Divide in the Gulf States: Embracing the Global, Ignoring the Local*. New York: Teachers College Press.
- Roser, M. 2015. "Life Expectancy." Our World in Data. <http://ourworldindata.org/data/population-growth-vital-statistics/life-expectancy/>.
- Schiffbauer, M., A. Sy, S. Hussain, H. Sahnoun, and P. Keefer. 2015. *Jobs or Privileges: Unleashing the Employment Potential of the Middle East and North Africa*. Washington: World Bank.
- Schøtt, T., P. Kew, and M. Cheraghi. 2015. *Future Potential: A GEM Perspective on Youth*

- Entrepreneurship 2015*. London: Global Entrepreneurship Monitor.
- Schroeder, C. 2013. *Startup Rising*. London: St. Martin's Press.
- Steer, L., H. Ghanem, and M. Jalbout. 2014. *Arab Youth: Missing Educational Foundations for a Productive Life?* Washington: Brookings Institution.
- TwoFour54. 2013. "Expert Advice from *Harvard Business Review* Now in Arabic." <http://www.twofour54.com/en/media-centre/press-releases/2013/2013-12-29-Expert-advice-from-Harvard-Business-Review-now-in-Arabic>.
- UNESCO. 2015. *Education for All 2000-2015: Achievements and Challenges—Education for All Global Monitoring Report*. Paris: UNESCO.
- UNICEF. 2015. *Curriculum, Accreditation, and Certification for Syrian Children in Syria, Turkey, Lebanon, Jordan, Iraq, and Egypt: Regional Study*. New York: United Nations Children's Fund.
- USAID (U.S. Agency for International Development). 2008. *Evaluation of the Jordan Education Initiative: Synthesis Report—Overview and Recommendations to the Jordan Education Initiative*. Washington: USAID. http://pdf.usaid.gov/pdf_docs/PDACL689.pdf.
- Yousif, A. A. 2009. *The State and Development of Adult Learning and Education in the Arab States: Regional Synthesis Report*. Geneva: UNESCO.
- Wakalat Anba'a al-Emarat (Emirates News Agency). 2015. "ADU's 2nd SCRATCH Competition Attracts Overwhelming Participation." <https://www.wam.ae/en/news/emirates/1395282679363.html>.
- World Bank. 2010. *Stepping Up Skills: For More Jobs and Higher Productivity*. Washington: World Bank.
- . 2015. *Databank: World Development Indicators*. Washington: World Bank.
- . 2016. *World Development Report 2016: Digital Dividends*. Washington.: World Bank.
- World Economic Forum. 2016. *The Future of Jobs: Employment, Skills, and Workforce Strategy for the Fourth Industrial Revolution*. Geneva: World Economic Forum.
- Wexler, E. 2015. "Public University Group Expands 'Personalized Learning' Efforts." *Chronicle of Higher Education, Wired Campus Blog*, November 16. <http://chronicle.com/blogs/wiredcampus/public-university-group-expands-personalized-learning-efforts/57616>.



The views expressed in this working paper do not necessarily reflect the official position of Brookings, its board or the advisory council members.

© 2016 The Brookings Institution

ISSN: 1939-9383

BROOKINGS

1775 Massachusetts Avenue, NW
Washington, DC 20036
202-797-6000
www.brookings.edu/global

