Relevance of DGBL in Enhancing Equity, Quality, and Efficiency in MENA

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Introduction

About a decade ago, the Middle East and North Africa (MENA) region[1] had almost reached universal education and literacy, but armed conflicts over the last 15 years have disrupted education in entire countries, resulting in 13 million Syrian, Iraqi, Yemeni, Palestinian, Libyan, and Sudanese children not attending school (United Nations Children's Fund [UNICEF], 2015). In neighboring countries, refugee flows have strained national education systems by adversely affecting education quality and existing infrastructure. However, conflict is not the only barrier to education in the Arab world: while many countries in the region have achieved gender parity in the representation of boys and girls in primary school, gender disparities remain particularly significant in Djibouti, Sudan, and Yemen (Jalbout, 2015). Furthermore, the youth bulge in MENA has put pressure on educational institutions, thus affecting education quality: basic skills are not being learned, as evidenced by poor performance in international standardized tests, while the skills being taught do not match those required by the job market (Hoel, 2014).

Efforts to address these challenges include digital game-based learning (DGBL), considered a disruptive approach to learning which could address some of the challenges faced by educators in the MENA region.

DGBL has the potential to expand access to learning materials and alleviate the need for physical learning environments. It also offers the opportunity for iterative and differentiated learning, thus addressing the quality of education delivery. Serious games or simulations with clear "learning outcomes can create interactive experiences that actively engage the players in the learning process, [whereby] experimentation, graceful failure, identification of lessons learned can result from game-based learning, where decisions and actions are chosen, consequences experienced, goals are achieved, and feedback is furnished (Sutton, 2016)." A landscape review of 44 projects using information and communications technology (ICT) for literacy concludes that "mobile technologies that have tremendous reach into all populations—young and old, urban and rural, rich and poor—provides a new opportunity to *reimagine* traditional forms of educational design and delivery" (JBS International, 2014, p. 29). A recent global meta-analysis of 77 randomized experiments evaluating the effects of school-based interventions on learning in primary schools in developing countries found that the largest mean effect sizes [among school-based interventions]

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[1] MENA, for the purposes of this study, refers primarily to that grouping of Middle Eastern countries where Arabic is the primary language spoken and corresponds roughly to the membership of the Arab League. The region has 27 countries where Arabic is an official language. Of these, 21 have Arabic as the official language, with a majority of Arabic language speakers; these countries are Algeria, Bahrain, Comoros, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Palestine, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, and Yemen. Six countries have Arabic as an official language, but with a minority of Arabic speakers; these are Chad, Djibouti, Eritrea, Israel, Malta, and Tanzania. Some references cited in this study use a slightly larger mapping of MENA to include countries such as Iran and Turkey.

were those with computers or instructional technology (McEwan, 2015).

Although DGBL is gaining momentum in the Middle East, few studies have been conducted to date on educational games, the markets for DGBL, and the impact of DGBL in the MENA region. Nevertheless, MENA holds significant potential for DGBL reach because of the high rate of mobile subscription and smartphone penetration, as well as the standardization of Modern Standard Arabic (fus-ha) instruction across the region. According to a study by mobile operators, in 2016 the MENA region had 339 million mobile phone subscribers, accounting for 60% of the population (GSM Association [GSMA], 2016).[2] Smartphone penetration more than doubled over the last three years, accounting for 42% of mobile subscribers' phones, and shows one of the fastest growth rates in the world, expected to reach 65% by 2020 to be on par with global averages (GSMA, 2016). The same study found that despite the high rate of subscriber penetration, significant gaps exist between regions: for example, the Gulf Cooperation Council has a penetration rate of 77% of the population, while in African Arab states such as Somalia and Djibouti, subscriber penetration rates are at about 30%, and Comoros and Palestine have yet to launch 3G (GSMA, 2016). Nevertheless, as Internet access and smartphone penetration increase, these avenues will offer new ways to reach marginalized populations, such as refugees on the move and rural populations with no access to schooling.

Innovators in the MENA region are responding to the fast-growing rate of mobile phone penetration, which has created a large and growing market for DGBL in Arabic. For app developers, mobile has served as the platform of choice for innovative digital solutions and services in MENA, with some MENA countries leading mobile innovation development. For example, Israel has attracted significant investment in innovation in the digital space, while Amman was labeled as one

of the best cities to launch a tech startup (GSMA, 2016). DGBL content developed in Arabic has a potential market of more than 350 million native speakers, or 20 states where Arabic is the primary official language, offering economies of scale to Arabic DGBL developers. In the MENA region, DGBL demand is projected to grow by 28% in the 2017-2020 period—the fourth highest out of seven global regions assessed in the 2017-2022 Global Game-Based Learning Market (Adkins, 2017).

DGBL Examples and Their Design

In the MENA region, DGBL solutions aiming to address the aforementioned gaps have primarily concentrated on early grade literacy and numeracy. This essay outlines three DGBL examples that seek to address literacy and numeracy gaps, where an evidence base exists around what has worked and what has not. One example focuses on enhancing the quality and efficiency of literacy education within formal education systems, while the other two examples center on broadening access to numeracy and literacy education among out-of-school populations of refugees and internally displaced persons.

The *Qysas* early grade digital-level library was designed to help early grade Jordanian students develop and strengthen foundational Arabic reading skills, while providing access to a library of 125 interactive books for Grades 1 to 3. Early grade reading assessments (EGRA) conducted in Jordan in 2012 and in Egypt in 2014 showed relatively weak performance in early grade literacy measures (RTI International, 2012; RTI International, 2014). Some areas of the Arab region show high repetition and dropout rates, especially in poor rural and urban communities (UNICEF, 2014). A recent United Nations Children's Fund-International Bureau of Education analysis of the grade repetition phenomenon in MENA concludes that (1) there is a significant link between repetition in the first grades

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[2] The MENA region, as defined by GSMA, includes Iran and Turkey.

of primary education and the learning of reading and writing; (2) significant changes are needed in the teaching of reading and writing, along with a thorough overhaul of the parameters and traditional practices usually applied to first literacy in formal and non-formal situations; and (3) greater awareness is needed regarding the impact of linguistic factors on school performance in general and on literacy in particular (Maamouri, n.d.). Responding to this gap, *Qysas* ("stories" in Arabic) was developed to expand access to books through a differentiated and iterative approach to reading, where students needing supplemental assistance are able to access it wherever they live. Under the All Children Reading: A Grand Challenge for Development grant, Little Thinking Minds initiated *Qysas* to provide engaging, appropriate, locally sourced reading content that would strengthen literacy outcomes among Jordanian early grade public school students.

The *Qysas* app contains five levels, each made up of three main components: (1) audio reading—a new book is presented to the child through an animated voice-over and interactive page turning; (2) practice reading—the child reads the book and turns the pages, and if the child cannot read the word, the child can touch the word and the audio function is activated; (3) reading comprehension—the child is asked a series of questions about the story and must answer a minimum number of questions correctly to mark the book as completed. *Qysas* groups learning into five levels that correspond to the first three grades of primary school, splitting learning into smaller learning modules. It animates texts for extensive reading practice, uses the vocabulary drawn from the 40% overlap between fus-ha and spoken Arabic, and uses a uniform letter size, font, and spacing to advance literacy automaticity. As those stages are completed at the child's own pace, the child is rewarded and the next level unlocks. On the back-end, individual student performance is tracked, offering the teacher a student-specific or class-wide dashboard of reading performance.

Although *Qysas* was tested by literacy clubs in public schools in Jordan, it can be used in a variety of learning environments: individually at school, in a group setting or club, or individually or with a peer/parent reader at home. Under the testing environment, schoolteachers and librarians were trained on how to apply *Qysas* as a tool for supplementary learning and literacy strengthening. The literacy club approach entailed a one-on-one student interface with *Qysas* twice a week in a classroom setting administered by a teacher for up to 45 minutes each time, for a total of 48 hours for the academic year. In that time, most children in the testing schools were able to finish all five levels, or 125 books. Where the average for the Arab world is six minutes spent reading annually, this program offered a simple solution to get children reading (Al-Yacoub, 2012). An impact evaluation of the program showed that *Qysas* advances literacy outcomes with statistical significance in syllable fluency, oral reading fluency, and reading comprehension, and significantly reduced zero scores in those three domains, as compared with control group performance (School-to-School International, 2017). Children were motivated to come to school on tablet days, as noted by their parents and seen in high attendance rates, and were also motivated to "level up," comparing reading levels among each other. Teachers and parents noted that practicing on *Qysas* also improved students' reading confidence, which they then displayed in other areas.

In the MENA region, one response to the Syrian refugee crisis was the launch of the EduApp4Syria competition, which took advantage of the increasingly widespread availability of smartphones among Syrian refugees to deliver an engaging learning supplement for out-of-school Syrian children (Norwegian Agency for Development Cooperation, n.d.). An estimated 2.3 million Syrian children are out of school because of a violent conflict in their country; many are coping with memories of multiple traumas and stress, which affect their ability to learn. To ensure that Syrian children have an opportunity to learn to read and continue

their lifelong learning process, the Norwegian Agency for Development Cooperation (Norad) and its partners—All Children Reading: A Grand Challenge for Development, Norwegian University of Science and Technology, Orange, and the Inter-Agency Network for Education in Emergencies—held an international innovation competition called EduApp4Syria to develop an engaging, open-source, smartphone application that could build foundation literacy skills in Arabic and improve the psychosocial well-being of Syrian refugee children (Norwegian Agency for Development Cooperation, n.d.). *Feed the Monster* and *Antura and the Letters* were the two winners in a field of open source smartphone applications.

CET Learning Environments designed *Feed the Monster* to engage children in a journey of discovery and friendship. They developed the app with the specific population of Syrian refugee children in mind, as demonstrated through the storyline describing a fantasy world where friendly monsters were sent into exile by Harboot (a known evil character), who conquered their land and cast a magic spell to turn them all into eggs. This storyline was written to nourish hope within the players as they find the eggs and feed them with Arabic letters, syllables, and words to help them evolve, grow, and prosper. To support learning of the Arabic language, a team of Arabic literacy experts broke the Arabic alphabet into small clusters of five to six letters each, in a way to match the main game mechanism (solving puzzles). In every cluster, the players must first learn the letters (shape and sounds), then practice the combination of letters and vowels (shape and sounds), and at the end of each cluster learn new words that are made up of the letters already presented (CET Learning Environments, 2016). This process is meant to be simple and engaging, and to foster a sense of fun among children while learning Arabic. Finally, to address psychosocial well-being, the app developers embedded the concept of social emotional learning (CET Learning Environments, 2016). Responding to research by Compas (as cited in CET Learning Environments, 2016) that shows that children exposed to crisis-affected settings can experience toxic stress, which in turn damages executive cognitive functions, the developers sought to provide a caring, nurturing, and predictable learning environment that builds children's socio-emotional skills. Within this game environment, children must interact with the friendly monsters and receive positive feedback, and must comfort and help their monsters when they are tired or upset.

Antura and the Letters was developed by a consortium including the Cologne Game Lab, Wixel Studios, and Video Games Without Borders. The game tasks the player with helping an old "Keeper" character watch over little Living Letters with a mind of their own. With the help of her dog, Antura, the player sets out through a series of mini games corresponding to content from the Syrian primary school curriculum. The app employs principles such as stealth learning, flow, and psychological modeling throughout (Cologne Game Lab, Video Games Without Borders & Wixel Studios, 2016a). The entire game comprises six journey maps that correspond to the six major stages of the Syrian primary school curriculum (Cologne Game Lab et al., 2016a). The design and pedagogical methodology consists of mini-games that address every pedagogical goal of a basic literacy curriculum. For instance, one mini-game presents an engaging way to learn correct letter shapes, while the next game pushes the player to focus on the sound of a letter in a word (Cologne Game Lab et al., 2016b). The game was designed with constant input from Arabic literacy experts, who broke the language into learning blocks with specific micro pedagogical goals to be achieved. A block of new letters, for example, requires not only recognizing the letter in a word but also the association of the letter's shape and sound, and how to write the letter, among other tasks (Cologne Game Lab et al., 2016a). In addition to fostering the player's literacy capabilities, *Antura and the Letters* was designed to support the player mentally and emotionally. According to the

developers, the core objective for mental well-being of *Antura and the Letters* is to put the player in a mental state of "procedural flow" (Cologne Game Lab et al., 2016a). This means that the game gives players a series of constant challenges to solve, both related to the learning content and to interacting physically with the game mechanics. Some mini-games also contain emotional incentives, as exemplified by the Egg mini-game where the player must help the Living Letters hatch. The Egg mini-game gives positive feedback when the player taps on the correct letter. Once the player has tapped enough times, the egg hatches and a Living Letter is born. In another mini-game, the player helps reconcile two words that have quarreled by joining them together through a shared letter (Cologne Game Lab et al., 2016a).

A mixed-method evaluation of *Feed the Monster* and *Antura and the Letters* was conducted in the summer of 2017 among control and treatment groups of Syrian refugee children, aged 5-10, who have little or no schooling, in the Azraq Refugee Camp in Jordan (Koval-Saifi & Plass, 2018a; Koval-Saifi & Plass 2018b). The experimental groups were exposed to digital game-based learning within summer camp programming for up to 45 minutes a day, five to six times per week, over a period of seven weeks. Qualitative findings show that both games have motivated children to attend summer camp, have engendered replicative literacy learning behaviors at home (such as drawing letters, making words, and teaching siblings), and have generated significant social interaction among peers both through competition on who will progress fastest through the games and peer-to-peer assistance in "leveling up" (Koval-Saifi & Plass, 2018a; Koval-Saifi & Plass, 2018b). Children who identified strongly with the games became authorities on and champions of the game, and/or took on social roles related to the game. Children and parents alike have reported improvements in both literacy learning and learning behaviors. Quantitative study findings and analysis show that even with a dosage as low as 22 hours

of game play, children playing the EduApp4Syria games showed promising improvements in both basic literacy scores and psychosocial well-being, as measured by EGRA and the Strengths and Difficulties Questionnaire (SDQ), respectively.

In Sudan, in an effort to serve the educational needs of more than 3 million out-of-school children aged 5-13 (UNICEF, 2015), a consortium of stakeholders including the Sudanese Ministry of Education, Ahfad University for Women, War Child Holland, and TNO, developed a serious game on mathematics targeting out-of-school children based on the Sudanese national mathematics curriculum (War Child Holland, 2016). Although Sudan has relatively good primary school enrolment rates, gross enrolment rates range from 37% in East Darfur to 85% in Al Gezira (War Child Holland, 2016). Sudan also faces significant challenges involving school resources, poor learning outcomes, and low federal spending. The accessibility and quality of education for children in Sudanese states still affected by conflict remain a challenge. The game developed, *Can't Wait to Learn – E-Learning Sudan* (ELS), aims to make "basic [math] education available where formally trained teachers or schools are not present. The initial concept intended to make basic education available without teachers or formal institutions, through the delivery of a serious game on hardware that is placed in a community, and supported by local facilitators" (War Child Holland, 2016, p. 17). *ELS* is also designed to address psychosocial well-being by teaching life skills, consequential decision-making, and solution thinking. It is delivered as "part of an e-Learning package that includes access to solar power and community facilitators trained in child-friendly approaches and on how to use the game and tablets" (Dahya, 2016, p. 20).

ELS consists of two game worlds and various mini-games to practice each mathematics concept through autonomous learning; it incorporates two distinct levels: the first level is that of game worlds,

which set the connecting narratives for the second level, that of separate mini-games (44 different mini-games, 160 variations of mini-games) (War Child Holland, 2016). Game World I asks the player/student to help other children achieve goals in their lives, like becoming a goat herder or doctor, using mainly familiar jobs/roles within the community or less familiar jobs like teacher or engineer. Game World II is a shop where children can buy and sell products, increase the number of products they can sell, and improve their shop. It uses an experiential learning approach to engage the children, providing instruction and a management system that tracks progress. Each mini-game is designed to address a specific mathematical concept, with progress based on performance, where children are able to work at their own pace, and higher levels unlock upon successful completion of games/tasks (War Child Holland, 2016).

According to the *ELS* report, the children played the mathematics game in community facilitator-administered learning sessions for a maximum of 45 minutes per day, five times per week, for four to six months (War Child Holland, 2016). Testing among 591 participating children revealed that children playing the game have improved their knowledge of mathematics, based on two different math tests: scores of children increased in Test A from a mean of 20 at baseline to a mean of 41 at endline, and increased in Test B from a mean of 32 at baseline to a mean of 41 at endline, out of a total score of 60 for Tests A and B, with no significant differences for gender (War Child Holland, 2016). Self-esteem, recorded on a four-point Likert scale, increased from 1.9 to 2.5 between baseline and endline (War Child Holland, 2016).

As the humanitarian community pilots various initiatives in the DGBL space, others will follow. For example, *Sahabati* ("My Cloud" in Arabic) is a project under development that aims to create a virtual school for children in crises, primarily targeting children affected by the Syrian crisis. *Sahabati* is designed to give children and adolescents affected by conflict in the region the opportunity to continue their education and receive certification for their learning, irrespective of their location and the schooling time they have lost, in four core subjects: Arabic, English, Math, and Science (UNICEF, 2015). It is planned to be linked with a system of online assessments and certification. Meanwhile in Lebanon, UNICEF is collaborating with the International Education Association on the "Raspberry Pi computer, a handheld device on which children learn numeracy skills and basic programming" (UNICEF, 2015, p. 12).

These efforts and development processes can serve as a model for the successful production of high-quality, affordable DGBL in MENA . Moreover, because of the high rates of Internet and smartphone penetration, and opportunities for market maximization and scalability presented by the widespread and standardized use of fus-ha across all Arab states, the potential for DGBL initiatives to bridge the current education gaps in the region is strong.

Factors Facilitating and Hindering the Effective Use of DGBL

The aforementioned examples demonstrate potential DGBL applications that can address some of the challenges faced by the education sector in the MENA region. While certain factors encourage widespread DGBL use—high and growing rates of mobile/smartphone penetration and common instruction in Modern Standard Arabic across the region—barriers to the effective use and scaling up of DGBL in MENA still exist.

Although mobile and Internet penetration rates in the region are strong and growing rapidly, those rates vary considerably from country to country and even within countries. In certain areas, technological infrastructure gaps and access will remain barriers to the effective use of DGBL. Nevertheless, the rates of both smartphone penetration and Internet

coverage are rapidly reducing those gaps, facilitating the effective use of DGBL. As technology adoption rises rapidly in many areas of MENA, the primary challenge in those MENA countries will no longer be lack of technology infrastructure to support smartphone penetration and Internet access, but rather the availability of that infrastructure in schools and educational institutions. At schools throughout the region, the technological infrastructure, even when present, is often insufficient to support DGBL. For example, in Jordan, almost all schools have computer labs and Internet connectivity, but in many of them, Internet access is inconsistent, the labs house outdated computers, and access to the labs is often not widespread or cannot enable one-to-one interface. As technology advances and its cost decreases, these infrastructure challenges could lessen. Furthermore, while current smartphone penetration rates in many MENA countries may mean that each household has a smartphone, equity of access to that smartphone is an issue to consider.

Nevertheless, many games, such as those described in this paper, require minimum tablet specifications. Although tablets with lower specifications may operate DGBL applications, technological malfunctions or sluggish performance due to low hardware specifications can frustrate and discourage student/teacher use of DGBL in the classroom. Although higher-end tablets that can support DGBL performance now cost about US$100 per tablet, which can be shared by multiple students thereby diffusing the cost per student, MENA governments are stretched thin in delivering regular educational programming, let alone supporting program budgets to integrate or accommodate DGBL, even though they spend on average 5% of GDP on education (World Bank, 2014).

Within conflict or refugee settings, technological infrastructure presents an even greater challenge, as basic or consistent availability of electricity is oftentimes unpredictable, making the simple act of charging a mobile device or tablet problematic. In Jordan and Sudan, initiatives such as solar-powered chargers for refugees or in community centers have somewhat addressed these issues for individuals with access to these chargers (Dahya, 2016). However, during the testing of EduApp4Syria games in the educational centers of refugee camps, when generators broke down or when fuel was unavailable to operate the generators, the lack of electricity prevented the charging of tablets, and hence the use of the tablets during class (Koval-Saifi & Plass, 2018a; Koval-Saifi & Plass, 2018b). Where DGBL has been applied in these settings, adapting to the context and its limitations has been key. Innovation Program Manager for War Child Holland Kate Radford said in an interview, "We believe we have been able to have successful learning outcomes because we have been cognizant of the context and we have adapted to the context." (quoted in Dahya, 2016, p. 15) In recognition of technological infrastructure limitations, EduApp4Syria games and *Qysas* were designed to run offline.

For DGBL programs that aim to be integrated or endorsed within formal education, another potential hurdle is DGBL integration in the curricula at two levels: the national curricula and within the classroom. The Ministry of Education buy-in for DGBL and/or curriculum reform can become a political challenge of negotiating and approving both content and structure of DGBL delivery within the national curricula. The landscape review of Education in Conflict & Crisis (Dahya, N. 2017) noted that understanding these political requirements "to help ensure content is appropriately and responsibly delivered, is important", and that content created in the West may be laden with "values, beliefs, or incomplete historical representations of both local and global issues" (p. 27). These issues become more salient in areas strained by conflict. The literature recommends sourcing content locally, where possible, and states that "working with governments and formal curriculum where possible can support

long-term education initiatives" (Education in Crisis, 2017, p. 30). For example, within *ELS* in Sudan, the Ministry of Education was involved in curriculum development, while with *Qysas* in Jordan, the platform was tested in public schools in Amman with Ministry of Education approval and participation (School-to-School International, 2017).

At the classroom level, integration requires that teachers be trained and/or experienced in DGBL play and instruction. They must also be motivated to use DGBL resources in the classroom. In many of the cited regional examples of DGBL use, teacher training in DGBL program use, as well as their motivation, are critical to its delivery, application, and use. This is confirmed by other worldwide studies documenting the importance of effective implementation by teachers in realizing the full potential of DGBL (Kangas, Koskinen, & Krokfors, 2017; Martinez-Garza & Clark, 2013; Martinez-Garza, Clark, & Nelson, 2013; Ertmer & Ottenbreit-Leftwich, 2010).

Finally, as more DGBL programs come online, educators need to differentiate between DGBL applications and know how they can be best used for maximum effect. In this sense, a greater evidence base is needed to show the impact of DGBL on learning. In the 2014 landscape review of 44 mobiles for reading (M4R) projects, "only one M4R project contained an adequate randomized control trial (RCT) impact evaluation design" (JBS International, 2014, p. ix). In the MENA region, very few DGBL applications have undergone rigorous testing to deliver such an evidence base. Moreover, even when an evidence base exists, it becomes critical to illustrate how DGBL can be used optimally within national education programs by subject and grade, and how teachers and education systems can benefit from their application and use. These demonstrations will be crucial to establishing buy-in from educators and governments in order to enable scaling up of DGBL in MENA and other regions.

How the Public and Private Sectors can Drive DGBL Use

All the DGBL examples in this paper have benefitted from some level of support in developing, testing, applying, using, or scaling up DGBL from development agencies or Global North government assistance. This is echoed globally, as the landscape review of M4R noted that "only about 10 percent of the projects [reviewed] are supported and run by local NGOs, but the large majority of projects are broader partnerships sustained by external funding agencies, most often in conjunction with local NGOs" (JBS International, 2014, p. ix).

In the MENA region, most of the DGBL developers come from the private sector, primarily producing DGBL content in response to market demand and zeroing in on individual and private sales, with less focus on creating DGBL content for or scaling up within the public sector. Because the need is great in the public sector, public-private sector cooperation may be necessary. Where donors have supported this linkage, there may be a disconnect between donors' desire to build on existing open educational resources and funding of open-source development of DGBL content, and the private sector developers' desire to maintain control over content for their financial sustainability. According to the landscape review of M4R, "only 16 percent of the [44] projects [reviewed] were explicitly 'open source' in their approach, which is in contrast to the common discourse about open resources in the ICT4D space" (JBS International, 2014, p. viii). This possibly reflects a need to revisit modalities for accessing public funds for DGBL development that could offer alternative approaches to open source DGBL content creation. R. Leege, former All Children Reading Project Director at World Vision (personal communication, September 18, 2017), suggested exploring "pricing models with some form of financial return to support continued development costs" or maintenance, data collection,

and game-evolution costs that could better serve both scaling up and sustainability aims.

To bridge the gap between the private and public sectors, agencies and governments should continue to support DGBL to sustain and scale up its use, and offer opportunities for private sector DGBL developers and public sector educators to meet. For example, the No Lost Generation EdTech Summit aims to "bring together innovators from the private, public, and development sectors to showcase and brainstorm tech-based solutions to the education and skills challenges caused by the crisis in Syria," under the umbrella of the No Lost Generation initiative, which seeks to support children and youth affected by the crisis in Syria, Turkey, Lebanon, Jordan, Iraq, and Egypt (No Lost Generation, 2017).

While the Global North donors continue to fund the development, testing, and scaling up of DGBL, perhaps more effort could be dedicated by all stakeholders in showcasing classroom-based approaches to DGBL use that maximize key learning outcomes and sustain the use of DGBL created under these grants. According to the landscape review of M4R, "many donor agencies and governments seem focused on driving up the supply of M4R applications, with less concern for the longer-term demand, which directly impacts sustainability (JBS International, 2017, p. ix)." Time and effort must be spent not only in generating DGBL content/products, providing an evidence base, and making those products available, but also in showcasing cost-effective and efficient ways to integrate DGBL into national curricula and educational delivery systems, such that MENA governments, humanitarian agencies, and educators can address obstacles more easily and better integrate DGBL in classrooms.

Finally, as Modern Standard Arabic is taught and acquired similarly across the region, successes in scaling up and integrating DGBL in MENA

educational settings should be shared with the larger region. Because of similarities both in education infrastructure/delivery/language and in education system delivery challenges in the MENA region, successes or delivery models may become easily replicable or adaptable across the region in both public school and refugee settings. Governments, agencies, and educators can support regional conferences around DGBL development, testing, scaling, approaches to integration, and curriculum reform to share experiences and learning, and offer opportunities for scaling up beyond national boundaries. Inviting all stakeholders where possible, including private sector DGBL developers and the innovators that made many of these DGBL developing companies or products viable—regional accelerators, venture capitalists, angel investors, philanthropists, and donors—could broaden the discussions on scaling up and sustainability.

As technology evolves and erodes the infrastructure barriers to widespread use and adoption of DGBL, DGBL will likely increasingly become part of the conversation to address equity, quality, and efficiency in education in MENA. As mobile technologies continue to expand their reach, new opportunities present themselves within DGBL to "reimagine" the ways in which educational content can be delivered. In a region unified by a common and standardized Arabic language, perhaps the greatest facilitator is the language of instruction, and the market of 350 million itself could drive DGBL content development. Nevertheless, without the active partnership of key stakeholders in the public sector, addressing equity of access to DGBL content will not be possible. It is critical that the entire ecosystem supporting DGBL development for improved educational outcomes in the public sector in MENA be engaged, and that economies of scale be maximized through sharing of successes and lessons learned.

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