



EDUCATIONLINKS USAID

ARABIC LITERACY AND NUMERACY STATE OF THE ART CONFERENCE DESK REVIEW FINAL REPORT

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ACRONYMS & ABBREVIATIONS

ASER	Annual State of Education Report
BL	Baseline
CLPM	Correct Letters Per Minute
CWPM	Correct Words Per Minute
DFID	UK Department for International Development
ECCE	Early Childhood Care and Education
EdData	Education Data for Decision Making
EGM	Early Grade Math
EGMA	Early Grade Mathematics Assessment
EGR	Early Grade Reading
EGRA	Early Grade Reading Assessment
EL	Endline
FY	Fiscal Year
GDP	Gross Domestic Product
GILO	Girls' Improved Learning Outcomes
GIZ	German Corporation for International Cooperation
IDELA	International Development and Early Learning Assessment
IRC	International Rescue Committee
MENA	Middle East North Africa
MNE	Ministry of National Education and Vocational Training
MOE	Ministry of Education
MSA	Modern Standard Arabic
NGO	Nongovernmental Organization
OECD	Organization for Economic Cooperation and Development
ORF	Oral Reading Fluency
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
QITABI	Quality Instruction Towards Access and Basic Education Improvement
RAMP	Reading and Math Project
READ	Reinforcing Education Accountability in Development
READ TA	Reading for Achievement of Ethiopia's Development Technical Assistance
RFS	Reading for Success
RQ	Research Question
RT	Reaction Time
SOTA	State of the Art
SSME	Snapshot of School Management Effectiveness Survey
TIMSS	Trends in International Mathematics and Science Study
UAE	United Arab Emirates
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
US	United States of America
USAID	United States Agency for International Development
YEGRA	Yemen Early Grade Reading Approach

EXECUTIVE SUMMARY

PURPOSE, RESEARCH QUESTIONS, METHODS, & SCOPE

The United States Agency for International Development's (USAID) Middle East Bureau commissioned this regional review of early grade reading (EGR) and early grade math (EGM) progress in Arabic-speaking countries across the Middle East and North Africa (MENA) region. Building on the 2013 *Topical Analysis of Early Grade Reading Instruction*, the purpose of the report is not to compare results across countries, but rather to identify and celebrate the progress countries have made in the last five years, and to identify best practices and/or gaps that exist, in order to inform future efforts across the region. This report contributes to furthering the goals of the 2017 Reinforcing Education Accountability in Development, or the READ Act,¹ and the U.S. Government Strategy on International Basic Education ([Fiscal Year] FY 2019-2023),² and November 2018 USAID Education Policy,³ all of which guide USAID's core development goal to improve quality education so that children and youth gain foundational skills to ensure self-reliance and skill development—expected drivers of economic growth. This research has been organized around two major questions and several sub-questions, as follows:

Research Question 1 (RQ1): What do the research-based literature and existing assessment data say about teaching and learning literacy and numeracy with a variety of learning groups across the Arabic-speaking countries in the MENA region today?

- What does the research on learning to read in Arabic—particularly the large body of research carried out by academics in the region—tell us about what works and what skills and sub-skills should be emphasized in Arabic reading improvement programs?
- What does the research on learning numeracy in Arabic tell us about what works and what skills and sub-skills should be emphasized in numeracy improvement programs?
- What are the missing resources that continue to inhibit EGR and EGM students to succeed in reaching literacy and numeracy benchmarks?
- What approaches to teacher training can be adopted/tailored for teachers of Arabic reading and numeracy? (e.g. pre-service, in-service, praxis)

Research Question 2 (RQ2): What is the current level of EGR and EGM performance in Arabic-speaking MENA countries according to targets (boys, girls, students in or out of school, marginalized, etc.)?

- Where has the most and least progress been made?
- What lessons learned and promising practices have been identified in USAID- and non-USAID funded Arabic literacy and numeracy efforts?
- What human resources development strategies have proven to be successful in terms of equipping teachers with the skills needed to support student-learning outcomes?
- What additional rigorous research could shed more light on effectively addressing gaps?

This report uses literature review as the primary research methodology to answer the questions above, drawing principally on project-based and donor-funded research and evaluation, as well as international assessment data and academic research from the last five years (since the publication of the *Topical Analysis of Early Grade Reading Instruction in Arabic* report in 2013).⁴ Where possible, the study also reviewed relevant Ministry of Education (MOE) reports and strategic frameworks. This study did not

¹ The READ Act text can be found here: <https://www.congress.gov/bill/115th-congress/senate-bill/623/text>

There are several sections that focus specifically on basic education (literacy, numeracy), marginalized children and vulnerable groups, gender parity, etc. that will be taken into consideration for research and workshop preparations.

² https://www.usaid.gov/sites/default/files/documents/1865/USG-Education-Strategy_FY2019-2023_Final_Web.pdf

³ https://www.usaid.gov/sites/default/files/documents/1865/2018_Education_Policy_FINAL_WEB.pdf

⁴ PIRLS, PISA, TIMSS international assessment data.

include any primary or field-based data collection and relies solely on existing resources as described above, which can be considered a limitation. However, as the reports included in this study are recent and used a high degree of research rigor, this limitation has been sufficiently mitigated.

While the boundaries of the MENA region are often debated, for the purposes of this report, this review is limited to countries where Arabic is the most common language. These countries include: Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates (UAE), West Bank/Gaza, and Yemen. As of 2019 Arabic was the first language of over 400 million speakers across the world, primarily among those who live in the MENA region. It is the fifth most spoken language in the world (Lewis, Simons, & Fenning, 2013). Over the last five years, the estimated population of Arabic speakers across the MENA region has risen by over 18 million people. Given this vast population and the centrality of both reading and mathematics in academic achievement, work-readiness, and life success, improving reading and mathematics teaching and learning across the region is critical.

FINDINGS & CONCLUSIONS

There is much to be optimistic about in MENA countries' progress in early grade reading and math achievement. While absolute scores are still low, MENA countries have made enormous progress in both EGR (e.g., letter sound identification and simple word reading – due to greater phonemic and syllabic awareness and decoding), and in EGM basic skills (e.g. number identification, quantity discrimination, simple addition and subtraction). However, in EGR, higher order skills such as oral reading fluency (ORF) and reading and listening comprehension continue to be a challenge, while in EGM number pattern identification, more complex addition and subtraction operations, and word problems have not progressed to the same degree, according to Early Grade Reading Assessment (EGRA) and Early Grade Math Assessment (EGMA) scores across the region. Scores from other international tests, such as Progress in International Reading Literacy Study (PIRLS), Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) confirm these trends across both subjects.

Research based literature and assessment data suggest that there is room for improvement in how both literacy and numeracy are taught. Best practice methods for teaching literacy and numeracy differ significantly due to the inherent differences in the nature of the two skill areas. As presented in a “Meet the Authors” event sponsored by the Global Reading Network to launch the report *Towards the Design and Implementation of Comprehensive Primary Grade Literacy and Numeracy Programs*, intrinsic differences in the nature of literacy and numeracy skill development require different approaches to how lessons are planned and delivered (Evans, Srikantaiah, Sugrue, & Sitabkhan, 2019).

In Literacy:

- Domains are nested
- Domains are interdependent and cannot be taught in isolation.

In Numeracy:

- Domains are not nested
- Children can develop spatial (geometry) or measurement skills without having developed an understanding of number operations” (Evans, Pallangyo, Sugrue, & Sitabkhan, 2019a).

Further, literacy skills are tied to the particularities of the language one is learning in; mathematical domains are more universal and consistent across contexts. Language particularities and the nested nature of domains can make the design and planning of literacy lessons quite complex. For example, for language teachers, multiple domains (i.e. phonemic awareness, phonics, listening comprehension, fluency, vocabulary, etc.) need to be taught in mutually reinforcing ways as opposed to discrete stand-alone elements.

For mathematics learning, the intrinsic differences in the nature of literacy and numeracy skill development, suggests that mathematic teachers must be well versed in instructional methods across all domains of mathematics as the domains are not as interrelated; thus, poor teaching in one domain can render students deficient in capacity in that domain, with no recourse for reinforcement.

Ultimately, MENA region governments and donors want to continue to build upon progress to achieve gains in higher order skills such as reading fluency and comprehension, solving complex problems, identifying number patterns, level two addition and subtraction.

EARLY GRADE READING

Since the publication of the *Topical Analysis on Early Grade Reading Instruction in Arabic* in 2013, new research continues to clarify and expand in greater depth the crucial factors for learning to read in Arabic. The development of working memory, inhibitory control, and attention control are foundational cognitive skills in reading and in many other activities. Two groups of higher-level skills build on these foundational skills: emergent literacy skills and language and cognitive skills. Both are essential building blocks in learning to read and are developed through word decoding and listening comprehension.

Reading interventions have focused more heavily on emergent literacy skills like phonological awareness, phonics, and word reading (decoding). However, there must be equal focus on developing students' listening comprehension skills. Reading fluency depends on both accurate decoding and understanding the language in which one is reading, especially if it is the first language in which one learns to read. The important point here is that decoding does not uniquely support ORF. ORF is necessary to be able to read with comprehension; students who read slowly and haltingly do not have the working memory to focus on the message—on what is being read—as they are too focused on figuring out individual words. Hence, when a halting reader finishes a sentence, he or she is likely to have already forgotten the first part of the sentence. There are several linguistic factors that impact learning to read in any language and are thus important in looking at learning to read in Arabic.

Diglossia: Arabic is a diglossic language; that is, it has a “high” and a “low” form that can differ substantially. The “low” form, or dialect, is used for oral communication and the “high” form generally for written communication (Assad & Eviatar, 2014). Diglossia presents challenges for both students and teachers because children must learn a very different form of Arabic in school from that which they speak in their daily lives. Several researchers liken learning MSA to learning a second language (Saiegh-Haddad, 2004).

Diacritics: In a diglossic language such as Arabic, research demonstrates that the use of diacritics can facilitate proper word pronunciation for beginning readers in Arabic. In general, student texts in the early grades use diacritics as a support to emergent reading skills. Generally, researchers credit diacritics with increasing word reading accuracy and comprehension. Recent research has focused more specifically on when diacritics are helpful in facilitating pronunciation and comprehension, such as learning isolated words, nonwords, in reading connected text such as sentences and passages, and when they slow down reading fluency.

Syntactical Awareness: Awareness of sentence construction is an aid to both decoding—figuring out an ambiguous word by its placement in the sentence—and in word comprehension. This is particularly true for Arabic because it has many homographs and most text in the upper primary grades is unvoveled or partially voveled. The context and position of a word in the sentence and the other words surrounding it give readers clues to its role in the sentence and thus its meaning. Children come to school with knowledge of syntax and exhibit this every day through their speech. In Arabic-speaking countries, where children speak a dialect of the language they will ultimately learn to read in, syntactic clues can be important in learning to read connected text. Some researchers advocate using a “sentence approach” to the teaching of reading that would more explicitly build on students' existing knowledge of syntax. They also

recommend pointing out common sentence patterns as a way to facilitate students' abilities to derive semantic and lexical clues from sentence contexts.

Morphological Awareness: Arabic words are based on word roots and patterns, using roots that include the addition of affixes such as prefixes, infixes, and suffixes. Some affixes signal the subject of the verb, added to the beginning of the verb in present and future tenses and to the end of the verb in past tense, as well as the object of the verb, added to the end of the verb. Suffixes can signal possession when added to end of nouns. Likewise, prefixes, infixes, and suffixes also communicate different meanings associated with a common root word. Morphological awareness and knowledge of word patterns, including the use of prefixes, suffixes, and infixes, is critical, especially with unvoiced text. Researchers assert that morphological knowledge helps students unlock semantic knowledge and that morphological knowledge contributes to decoding, ORF, and semantic understanding of text. Morphological knowledge facilitates visual word recognition of the Arabic root and aids in the development of a “mental lexicon,” which speeds up reaction time in the word recognition process. Several researchers advocate an explicit focus on building morphological skills in the teaching of reading: “One pedagogical implication that may follow our findings is the need for direct instruction of morphological knowledge in elementary school by raising awareness to the meaning of linguistic derivation of the root morpheme and by exposure to it” (Shalhoub-Awwad & Leikin, 2016). Lastly, and in relation to incorporating some focus on morphological awareness more directly into early grade instruction, Saiegh-Haddad and Schiff report that there are orthographical benefits that come from morphological knowledge: “Moreover, Arabic spelling, even in young children, was found to benefit from morphological awareness and morphological intervention” (Taha, 2016).

The multiple factors discussed above effect students' ability to achieve reading comprehension in Arabic. Overall, these findings have important implications for learning to read in Arabic, suggesting that phonetic decoding—skills that are highly emphasized in donor-funded reading initiatives in the Arabic speaking world and advocated for by Ministries—are incomplete in terms of what needs to be considered. Further, they suggest that an explicit focus on expanding and reinforcing morphological awareness is important in learning to read in Arabic. Research suggests that there is a gap between these findings and their implementation in instructional content and strategies in early grade classrooms in the MENA region.

EARLY GRADE READING RESULTS

This review documents notable progress in reading results in the MENA region over the last five years. Much progress in early grade reading has occurred at the level of phonemic and syllabic awareness and decoding, as seen in the results of multiple EGRA administrations in Egypt, Jordan, Lebanon, Morocco and the West Bank. The results also highlight struggles in decoding, ORF and reading comprehension. On international reading tests, such as PIRLS and PISA, participating Arabic speaking countries have generally made consistent progress. Additionally, girls consistently outperformed boys on these tests. This could be related to varying stages of growth and maturation in girls and boys, or possibly the daily lives of girls versus boys. Overall, girls generally showed stronger performance than boys on early grade reading assessments.

Two countries reported reading data from a single EGRA or multiple assessments that used different instruments. In Iraq, results from a single EGRA indicate that students generally made progress from Grade 2 to 3, but not enough to become fluent readers. Data on Syrian students' reading and math performance from robust studies are lacking, however, two small studies – one using the International Development and Early Learning Assessment (IDELA) tool and the second used the Annual State of Education (ASER) tool. These studies both constitute “emerging” evidence in terms of rigor. Nonetheless results indicate that children in war-impacted regions of Syria are not developing foundational skills in reading.

Early grade reading projects in Morocco, Jordan, Lebanon, the Web Bank, Yemen, and Egypt have succeeded in introducing phonics-based instruction and training teachers to use this approach. Projects have also successfully worked with MOEs to create additional reading materials, particularly for early

grade readers, to support read-alouds, listening comprehension, and vocabulary building. Another important function of story reading, in addition to vocabulary-building, and is exposing children to Modern Standard Arabic (MSA), including its syntactical conventions, endings, pronunciation, etc. It is critical, especially in diglossic contexts, to build listening comprehension skills, which are an essential part of learning to read.

ARABIC INSTRUCTION

Skills and sub-skills for Arabic reading. Recognizing word roots (morphology) are important in learning to read in Arabic and this skill needs to be more explicitly taught and not from a grammatical perspective. The same is true in recognizing sentence structures and patterns in Arabic. Verbal and nominal sentences are generally taught; however, the use of context clues that are inherent in each type of sentence should be better taught to aid comprehension. Additionally, more time is needed on the subject of reading, including having enough independent reading time (including time to read silently in class) and opportunities to write expressively. In mid-to-later elementary school, children receive a good amount of instruction in Arabic grammar, though it is often abstractly taught. Developing fluency and comprehension as a reader requires practice since reading is not a theoretical exercise; rather it is a practical skill.

Pre-service training. Many teachers are not yet fully prepared (by training or certification) to teach generally, and more specifically, to teach students how to read in Arabic. Both pedagogy (reciting materials and passages, memorizing grammar and spelling rules for example) and content and materials (such as, transitioning from dialects of Arabic to MSA) need to be addressed more effectively to successfully teach students to read. Traditional, rote methods of teaching Arabic are still in use and need to be modernized and adapted better to primary school-aged children (Taha, 2017). Arabic language teacher preparation, although evolving, is still weak and in many cases the lowest performing students in teacher preparation programs are funneled into Arabic teaching (Taha, 2017). Furthermore, teachers receive inadequate field experience in pre-service training and insufficient ongoing professional development in teaching Arabic once they are in the classroom. In sum, there is a need to improve teacher-preparation programs that balance Arabic language content and pedagogical skills.

Instructional practices. Strategies to improve reading comprehension include developing clear and direct instructional guidance, training, and accompanying materials to use with early grade students. Comprehension strategies can be more difficult for teachers to incorporate into their lessons. They often involve instructional configurations that are harder for teachers to manage such as pair work, group work, silent reading, and modeling their own comprehension strategies, which is less commonly integrated into pre-service and in-service teacher training on teaching reading in Arabic.

EARLY GRADE MATHEMATICS

EGM is an expanding priority among governments and donors, and awareness of the enabling relationship between early grade math and reading skills is growing. The literature suggests that generally, the early grade mathematic skills that are the focus of instruction include: “(1) understanding, (2) computing, (3) applying, (4) reasoning, and (5) engaging” (Matar, Sitabkhan, & Brombacher, 2013). The National Council of Mathematics, founded in 1920 and currently the world’s largest mathematics education organization throughout the US and Canada, more recently articulated five “Process Standards” which describe transversal skills critical to learning mathematics content, which are developed through excellent instruction. These are:

- Problem Solving: apply and adapt strategies to solve problems
- Reasoning & Proof: recognize, select, and use various types of reasoning and methods of proof
- Communication: communicate mathematical thinking to others
- Connections: recognize, understand, and apply interconnected mathematical ideas
- Representation: create and use representations to interpret mathematical phenomena

TIMSS measures mathematical knowledge in three domains: knowing, applying, and reasoning. Knowing covers basic mathematical operations, procedures, etc. Application refers to the ability to apply knowledge and understand problems on a more conceptual level. Reasoning focuses not merely on solving simple problems but on navigating unfamiliar and complex problems that might require multiple steps. In general, in the MENA region, much progress has been made in the knowing domain, but less has occurred in the application domain and even less in the reasoning domain. Research indicates that mathematics curriculum structure and content may be hindering students' progress. Matar, in the 2013 German Corporation for International Cooperation (GIZ) publication *Early Primary Mathematics Education* describes early grade math curricula in the Arabic speaking world as generally “prescriptive” and points out that, “Most schools are provided with student textbooks and teacher guides that minimize the degree of autonomy of math teachers in organizing teaching and learning in ways that meet the needs of their students.” With curricula that are frequently packed with content or information and an instructional guide that sets the pace for teachers, time for active pedagogies, checking student understanding, emphasizing concepts over processes and re-teaching material not well understood is scarce.

EARLY GRADE MATHEMATICS RESULTS

EGMA, TIMSS and PISA all indicate that achievement levels in primary level mathematics are generally improving. EGMA has not been administered multiple times in most countries across the region so scores represent a snapshot of where the region is or was at the time of administration. Only Jordan has carried out multiple EGMA administrations which demonstrated substantial improvement in EGM outcomes (particularly in conceptual mathematics task or doing math with understanding) from the first to the second administration.

The 2015 international assessments of PISA and TIMSS presented some disappointing results. Except for Qatar (which had a significant score gain), Arabic speaking countries tended to see their scores in mathematics drop. This occurred for every MENA country on the PISA and for Saudi Arabia (Grade 4 and 8 scores) and Jordan (Grade 8) on the TIMSS. The good news is that, except for Saudi Arabia and Jordan, the rest of the MENA region countries saw student TIMSS mathematics scores improve modestly.

Results from the 2015 TIMSS also pointed to interesting gender trends. Boys' scores were generally lower than girls' scores in most of the countries— Bahrain, Morocco, Oman, Qatar and the UAE; however, boys had much higher scores than girls in Qatar. In Saudi Arabia, the scores for both boys and girls in Grades 4 and 8 did not improve and boys showed lower performances than girls.

In short, TIMSS data, as well as EGMA and PISA data reviewed in this study indicate that there are significant gaps in student capabilities in early grade mathematics in the MENA region, particularly related to higher order and more conceptual skills mathematical knowledge (Mullis, Martin, Foy, & Hooper, 2016).

MATH INSTRUCTION

Skills and sub-skills for numeracy. Higher order skills are less emphasized by teachers and need to receive increased focus in the classroom. Variables related to school climate impact mathematics teachers (and probably others) and this in turn impacts student learning. Teaching is still somewhat rote, based on the memorization of formulas, lacking an emphasis on ensuring an understanding of mathematical principles.

Pre-service training. The TIMSS 2007 International Mathematics Report had a chapter that focused on issues of teacher preparation. The key finding was that throughout the region, but especially in lower income MENA countries, the vast majority of mathematics teachers do not have a university degree (in any subject). While a degree does not guarantee high quality instruction, it does speak to some level of professional and subject area knowledge and the same is true for in-service teacher professional development.

Instructional practices. Research from the United States of America (US) demonstrates that attitudes

toward mathematics learning are highly influenced by teaching techniques (Domino, 2009). There is a relationship between student achievement in mathematics and students' attitudes toward mathematics. If students understand the content, they tend to like math; if they do not, they tend to dislike it. Understanding was linked to seeing the relevance of math to daily life, active learning (as opposed to teacher lectures), checking students' understanding (and explaining or re-teaching if students do not understand), teaching at a suitable pace (generally a slower pace that gives students time to grapple with concepts and not just memorize rules or formulas) and sometimes providing additional or supplemental instruction (Hadidi, 2015). This suggests that in the MENA region, mathematics teacher preparation programs that emphasize connections to real life, active pedagogies, appropriate instructional pacing, conceptual understanding and effective monitoring of students' understanding of the material could lead to gains in students' mathematical achievement.

Additionally, in mathematics, students would benefit from more hands-on activities and the availability of manipulatives in the classroom to work with. Finally, students need instruction that focuses on problem solving—whether the use of inference in reading or examining multiple ways to solve mathematics problems.

EGR AND EGM FOR CONFLICT-AFFECTED CHILDREN AND CHILDREN WITH DISABILITIES

Conflict-affected children. There are a few small studies with data on marginalized children in the region that indicate limited progress in EGR or EGM. However, literacy and numeracy outcomes for conflict-affected children are receiving growing attention, which is clearly a positive development. Conflicts in the MENA region are affecting children and youth for longer time periods and integrating focused learning outcomes, such as literacy and numeracy, with psycho-social support programs is now part of many humanitarian and development programs in these contexts in both formal and non-formal learning environments.

Children with disabilities. Progress has been slow in terms of literacy and numeracy outcomes for children with disabilities. Effectively teaching children with disabilities has emerged as an area educational policy makers are grappling with across the region and research indicates that there are common issues across countries, suggesting that common solutions could also be tailored and applied across MENA contexts. Common challenges across countries include the fact that children with disabilities are not accurately diagnosed or counted and those receiving special education are not tracked. However, parental recognition of the issue has also grown as evidenced by the nascent use of both home testing and behavioral therapy interventions for children with disabilities (Hadidi, 2015). Significantly, teaching children with disabilities now seems to be more prominently on the radar of educational policy makers across the region, but education services for children with disabilities is still severely lacking.

RECOMMENDATIONS FOR ADDRESSING ACHIEVEMENT GAPS IN EARLY GRADE READING AND MATH

Students

- Expose children to MSA consistently, both inside and outside of the classroom.
- Ensure that children have time to read aloud and silently.
- Ensure that students have time to work with manipulables and engage in practice and problem solving themselves—individually and in pairs or groups—in the classroom.

Teachers / Instruction

- Continue to train EGR and EGM teachers in best practices, including how to better teach some of the higher-order or more complex skills of reading, such as comprehension, and monitor student performance in reading and how to monitor student performance in math.
- Continue to focus on phonological and phonemic awareness and phonics.

- Develop instructional strategies and materials to more directly develop and reinforce syntactical and morphological awareness.
- Focus instruction on more conceptual, higher order skills such as number patterns, Level 2 (i.e. more complex operations) in addition, subtraction, and word problems.
- Focus instruction on applying skills and reasoning and less on memorizing facts and procedural aspects.

Supervision

- Engage supervisors in mentoring teachers and helping to keep them on track in terms of using best practices in EGR and EGM instruction.

Materials

- Ensure a greater supply of engaging, grade and age appropriate reading materials for students to access and hands-on mathematics teaching aids, ideally that students can use themselves in the classroom.

Curriculum

- Consider curriculum revision to ensure that reading is taught coherently and comprehensively within the larger Arabic language curriculum.

Research

- Conduct further research on: 1) how best to design and implement remedial programs for children who have fallen behind in the early grades in reading and mathematics; 2) approaches to improve reading and mathematics outcomes for children with special needs; and, 3) approaches to providing reading and mathematics instruction and materials to children in crisis and conflict situations.

FUTURE RESEARCH QUESTIONS

More research on early grade reading and mathematics learning and instruction is clearly necessary to hone in on the most effective strategies and practices to achieve greater learning and skill development in these areas. Many outstanding research questions remain, which, if pursued, would contribute to and enlarge the knowledge base in promoting effective EGR and EGM instruction and learning. These questions include – among others – greater inquiry into assessment methods and tools, depth of reading instruction, integration of tailored EGR and EGM pedagogic strategies, how writing is taught and perceived in relation to EGR, how to better teach comprehension strategies, how school leadership can support EGR and EGM in the MENA region and finally, how do we translate the findings from the high quality experimental and quasi-experimental research on EGR and EGM in the region into curriculum, materials, pedagogical guidance and instructional strategies for use in classrooms?

I. INTRODUCTION AND RESEARCH OVERVIEW

RESEARCH PURPOSE AND BACKGROUND

The United States Agency for International Development (USAID) has been the lead donor on early grade reading (EGR) interventions in the Middle East and North Africa (MENA) region for the past decade, especially after the 2011 USAID Education Strategy⁵ identified improved reading skills as a goal and the EGR Assessment (EGRA) became a common tool to measure quality improvements in early grade reading achievement. Many Ministries of Education, donors, and implementing partners have worked with USAID and other funders to use results from EGRA and, increasingly, the Early Grades Mathematics Assessment (EGMA), to build intervention programs to improve EGR and early grade mathematics (EGM) outcomes in their countries. The focus on EGR and EGM has spurred an expansion in assessment tools (e.g. Annual Status of Education Report (ASER) to track EGR and EGM student outcomes and has contributed to refinements in how progress toward the Sustainable Development Goals in education are tracked. In addition, EGRA and EGMA results, and results from other EGR and EGM assessments, have created a foundation for discussions on how to tailor EGR and EGM interventions for conflict contexts and design effective interventions for children with disabilities.

Within this context, the USAID Middle East Bureau commissioned this desk review report to examine reading and math progress in Arabic-speaking countries across the MENA region. This is not a comparative study, rather it was designed to identify progress that each country reviewed has made, all of which have very different starting points, and to identify best practices and/or gaps that exist to inform future efforts in all countries across the region.

This research builds on the 2013 *Topical Analysis of Early Grade Reading Instruction* and the All Children Learning conference that took place in December 2013 in Rabat, Morocco. This report is designed to share with readers an understanding of the impact of EGR and EGM interventions over the past decade. While EGM activities have generally received less attention than EGR activities, there has been increasing attention on the topic in the MENA region and the interest in expanding the focus on math, applying EGR strategies in math reform efforts has become a natural next step. Further, this report will contribute to the 2017 Reinforcing Education Accountability in Development, or the READ Act,⁶ and the U.S. Government Strategy on International Basic Education (FY 2019-2023)⁷ and November 2018 USAID Education Policy,⁸ all of which guide USAID's core development goal to improve quality education so that children and youth gain foundational skills to ensure self-reliance and skill development—expected drivers of economic growth.

RESEARCH QUESTIONS

Research Question I (RQ I): What do the research-based literature and existing assessment data say about teaching and learning literacy and numeracy with a variety of learning groups across the Arabic-speaking countries in the MENA region today?

- What does the research on learning to read in Arabic—particularly the large body of research carried out by academics in the region—tell us about what works and what skills and sub-skills should be emphasized in Arabic reading improvement programs?
- What does the research on learning numeracy in Arabic tell us about what works and what skills and sub-skills should be emphasized in numeracy improvement programs?

⁵ https://www.usaid.gov/sites/default/files/documents/1865/USAID_Education_Strategy.pdf

⁶ The READ Act text can be found here: <https://www.congress.gov/bill/115th-congress/senate-bill/623/text>

There are several sections that focus specifically on basic education (literacy, numeracy), marginalized children and vulnerable groups, gender parity, etc. that will be taken into consideration for research and workshop preparations.

⁷ https://www.usaid.gov/sites/default/files/documents/1865/USG-Education-Strategy_FY2019-2023_Final_Web.pdf

⁸ https://www.usaid.gov/sites/default/files/documents/1865/2018_Education_Policy_FINAL_WEB.pdf

- What are the missing resources that continue to inhibit EGR and EGM students to succeed in reaching literacy and numeracy benchmarks?
- What approaches to teacher training can be adopted/tailored for teachers of Arabic reading and numeracy? (e.g. pre-service, in-service, praxis)

Research Question 2 (RQ2): What is the current level of EGR and EGM performance in Arabic-speaking MENA countries according to targets (boys, girls, students in or out of school, marginalized, etc.)?

- Where has the most and least progress been made?
- What lessons learned and promising practices have been identified in USAID- and non-USAID funded Arabic literacy and numeracy efforts?
- What human resources development strategies have proven to be successful in terms of equipping teachers with the skills needed to support student-learning outcomes?
- What additional rigorous research could shed more light on effectively addressing gaps?

METHODOLOGY AND ANALYSIS

This report uses literature review as the primary methodology to answer the research questions above, drawing principally on research from the last five years (since the publication of the *Topical Analysis of Early Grade Reading Instruction in Arabic Report* in 2013). This study also reviewed, where available, Ministry of Education (MOE) reports and strategic frameworks, as well as reports of student performance across the region.⁹ This study does not include any primary or field-based data collection and relies solely on existing resources, including both academic literature and results from rigorous, donor-funded/project-based and Ministry research in the MENA region.

A wide range of research-based studies and were collected, assessed, and categorized according to their rigor (strong, satisfactory, or emerging). Academic literature published in peer-reviewed journals was reviewed based on the relevance to the topic of Arabic reading and math education and categorized the peer-reviewed academic publications as “strong.” When reviewing project-based literature and donor studies, research-based reports that met standards of rigor in both validity and reliability were selected in assessing and reporting on both progress and gaps in Arabic reading and math education. These benchmarks were used as a scale against which to determine the validity of reported results. Potentially informative reports that had very small samples or less rigorous research designs were not discarded, as these can be informative of emerging trends and potentially useful interventions. However, any “emerging” research in cases where additional studies or confirmatory evidence are warranted were specifically noted.

First, research and reports across MENA countries were analyzed to identify regional trends. At the country level, findings against progress made in reading and mathematics results and against best practices of promoting EGR and EGM skills were analyzed. Where available, reported data disaggregated by gender, and vulnerable populations (such as disability status) for each country was examined. A primary focus was on reports of student performance, classroom observation data on teaching practices, classroom resources, instructional materials, teacher support, professional development and parent/community engagement, where available.

LIMITATIONS

The main limitations of this study relate to the exclusive use of existing research. The study questions reflect the scope and focus of existing materials and data, so specific demographics, such as students with disabilities, were limited. However, as these reports are recent and used a high degree of research rigor, this limitation had minimal consequence on the accuracy and usefulness of the information presented in

⁹ The complete bibliography can be found in Annex II.

this report. While some EGRA/EGMA research activities are broad in scope within countries, another limitation is the reach of some of these reports, particularly those that focus within a narrow geography. By casting a wide net in terms of the literature examined, and not limiting the research exclusively to USAID project-based reports, this limitation was also mitigated.

ORGANIZATION OF THE REPORT

This report begins with a background on education in the MENA region, to contextualize the significance of the research topic, provide background on the perceptions and roles of education and literacy in the MENA region, and discuss the magnitude of challenges the region faces moving forward. The next section provides findings and analysis. Research Question 1 (RQ1) findings examining the most important factors in EGR and EGM teaching and learning in Arabic and RQ 2 looked at the results countries have achieved over the past decade, related to EGR and EGM performance and provide tables of EGR and EGM assessment results, as well as results from other assessments. Where information is available, approaches and strategies used by EGR and EGM projects in the region for which there is student achievement data are described and used to synthesize regional trends from these results.

II. BACKGROUND AND STATUS OF EDUCATION IN THE MENA REGION

The boundaries of the MENA region are often debated, with great variety of countries included depending on the definitions. For the purposes of this report, countries reviewed were limited to where Arabic is the most common language. These countries include: Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates (UAE), West Bank/Gaza, and Yemen. The map in Figure 1 shows the geographic reach of Arabic-speaking countries across the MENA region.

Figure 1: Arabic-speaking countries across the MENA region



LANGUAGE AND EDUCATIONAL CONTEXT

Language usage statistics vary depending on whether counts include only native speakers or native speakers and bilinguals. The World Factbook ranks Arabic as the third most spoken language in the world, in terms of percentage of native speakers, behind Mandarin Chinese at 12 percent, and Spanish at 6 percent. In the same reference, Arabic tied with English, each having 5 percent of the world's population as native speakers.¹⁰ A report in the Washington Post in 2015, drawing from a 15 year-long study by Ulrich Ammon at the University of Dusseldorf, which counted both first and second language speakers, put the number of Arabic speakers at 467 million and found Arabic to be spoken across 60 countries of the world, second only to English.¹¹ Alternatively, the 2019 edition of *Ethnologue: Languages of the World* (Eberhard, D.M., Simons, G.F. & Fennig, C.D. 2019), puts the number of native Arabic speakers a bit lower at 319 million.¹²

According to the World Factbook 2018, Arabic is the first language of at least 420 million speakers across

¹⁰ <https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html>

¹¹ https://www.washingtonpost.com/news/worldviews/wp/2015/04/23/the-worlds-languages-in-7-maps-and-charts/?noredirect=on&utm_term=.46fc8d9072af

¹² <http://www.ethnologue.com>.

the world, a majority of whom live in the MENA region.¹³ This figure assumes, however, that all citizens of a country speak its official language(s). In North African countries, for example, the first language of many citizens is from the Amazigh (Berber) family of languages. In other cases, children grow up bilingual or trilingual, speaking French or English along with Arabic and Amazigh. While Arabic is the official language of instruction in most Arab countries, the impact of these other languages on children’s early learning in school is an important consideration. Likewise, it is important to remember that most Arabic speaking countries also introduce instruction in either English or French in primary school. Table I identifies the countries that list Arabic as their first and/or official language and the estimated population of each country.

Table I: Arabic-speaking populations across MENA have increased since 2012¹⁴

Country	Population (2012)	Population (2018)	Change
Algeria	38,087,812	41,657,488	3,569,676
Bahrain	1,046,224	1,442,659	396,435
Chad	10,740,000	15,833,116	5,093,116
Egypt	85,294,388	99,413,317	14,118,929
Iraq	31,858,481	40,194,216	8,335,735
Jordan	6,482,081	10,458,413	3,976,332
Kuwait	1,403,962	2,916,467	1,512,505
Lebanon	4,131,583	6,100,075	1,968,492
Libya	6,002,347	6,754,507	752,160
Mauritania	3,437,610	3,840,429	402,819
Morocco	32,649,130	34,314,130	1,665,000
Oman	3,154,135	4,613,241	1,459,106
Qatar	2,042,444	2,363,569	321,125
Saudi Arabia	21,363,507	33,091,113	11,727,606
Sudan	34,847,910	43,120,843	8,272,933
Syria	22,457,336	19,454,263	-3,003,073
Tunisia	10,835,873	11,516,189	680,316
UAE	5,473,972	9,701,315	4,227,343
West Bank/Gaza	3,761,646	4,635,207	873,561
Yemen	25,408,288	28,667,230	3,258,942
Total	350,478,729	420,087,787	69,609,058

Included are the World Factbook numbers from the 2013 *Topical Analysis of Early Grade Reading Instructional*

¹³ Compilation of country information from countries where Arabic is an official language from: CIA World Factbook, 2019: <https://www.cia.gov/library/publications/the-world-factbook/>

¹⁴ CIA World Factbook, 2019: <https://www.cia.gov/library/publications/the-world-factbook/>

Practices to highlight the growing number of Arabic speakers over the last six years. Given the increasing number of Arabic speakers in the world, Arabic language literacy is a pressing concern for predominantly Arabic-speaking countries. (Notably, the only country whose Arabic-speaking population has declined is Syria. The high rate of migration out of the country as a result from the ongoing conflict likely explains this trend.) Given this vast population and the centrality of both reading and mathematics in academic achievement, work-readiness, and life success, improving reading and mathematics teaching and learning across the region is critical.

The written word and those who can read it have long been held in high esteem in the MENA region. Many consider being educated and highly literate in Arabic, specifically in reading, writing, listening, and speaking, a mark of distinction. Definitions of literacy have changed over the centuries since the first Qur'anic verse was delivered to the Prophet Mohammed. The ability to recite the Qur'an or other seminal works in Arabic was an essential aspect of literacy in the centuries after God's revelation to Mohammed, up through the mid-20th century. However, during the mid-20th century, with the growth of national public-school systems across the MENA region, the definition of literacy gradually began to shift, and communication received greater emphasis over the ability to recite. In 2019, under global definitions and standards for education, literacy is now focused more explicitly on the notion of deriving meaning from text and on understanding text-based messages and communication through a variety of mediums, such as textbooks, children's story books, instructions, forms, advertisements, signs, text messages, social media, and the internet. This shift in focus aligns with the types of skills demanded in the 21st century. The ability to derive meaning from written text is a critical life-skill today, thus the importance of learning to read and write in the early grades of school.

This same historical outline of the prestige of literacy can be applied to mathematics learning. At the height of the Arab Empire (generally considered to be between the 8th and 14th centuries), Arab intellectuals made great strides in mathematics and the related fields of medicine, astronomy, other sciences, and philosophy. Arab contributions to the field of mathematics are significant, including the Arabic translation of Greek, Indian, Syriac, and Persian mathematicians. Abu l'Hasan al-Uqlidisi (920-980) is known as the first mathematician to use decimal fractions; Thabit ibn Qurra (826-901) was a mathematician, physician, and astronomer who is commonly referred to as the founder of statistics. Muhammad ibn Musa al-Khwarizmi (780-850) is well known for his contributions to solving Algebraic equations. In fact, the name al-Khwarizmi is the root of the word "algorisimi" or algorithm.

These illustrious regional traditions in both reading and mathematics were at their peak in an era when

education was not universal, when most people did not go to school, beyond some Qur'anic schooling or religious instruction, and when literacy and numeracy skills were not necessary to earning a living and finding productive work. However, today, in an era when we seek universal education and literacy and numeracy are basic life skills, we find that school systems—and particularly teaching methods—across the MENA region have not evolved and changed to meet the challenge of developing a highly literate and mathematically skilled citizenry. According to a report from UNICEF's MENA Regional Office entitled

The Archangel Gabriel's first contact with Mohammad was to impart the following message:

*In the name of God, the Gracious, the Merciful. Read:
In the Name of your Lord who created. Created man
From a clot.
Read: And your Lord is the Most Generous. He
Who taught by the pen.
Taught man what he never knew.*

-Holy Quran 96:1-5

Downloaded from: <http://www.clearquran.com/>. Translated from Arabic by Talal Itani.

Reimagining Life Skills and Citizenship Education in the Middle East and North Africa: A Four-Dimensional and Systems Approach to 21st Century Skills, "...constrained by traditional classroom teaching, learning techniques and examination practices, children and youth in MENA generally do not receive an education that is aligned with contemporary realities and labour market requirements" (UNICEF MENA Regional Office, 2017, p. 1). The report also asserts that "the general consensus is that education systems are broadly failing to deliver the outcomes needed to advance individual and social development, and that the increasing number of education opportunities in the region has yet to translate into economic growth" (UNICEF MENA Regional Office, 2017, p. 1).

Most countries in the MENA region are middle-income countries or above, excluding Yemen, and most invest substantially in their educational systems. A 2014 World Bank Brief asserts that, "the average public investment in education across the [MENA] region as a percentage of [gross domestic product] GDP is above 5.3 percent" (Hoel, 2014). Similarly, new enrollment across the region has increased dramatically, from 86 percent in 2000 to 94 percent in 2010. The region has also quadrupled the average level of schooling since 1960, halved illiteracy since 1980, and achieved almost complete gender parity for primary education. However, pervasive challenges persist, including low educational quality, a skills-market mismatch, and a youth bulge expected to grow by almost 10 million from 2015 to 2030, as well as increasing calls for better governance and accountability within educational systems and the ongoing Syrian conflict and concomitant refugee crisis (Hoel, 2014). However, Arabic-speaking countries have reasons to be optimistic. Educational reform efforts are underway to target early grade reading and early grade mathematical skills. Various international measures of progress in both reading and mathematics show an upward trend of progress in the region and government and Ministry efforts are increasingly brought to bear in improving early grade education and skill acquisition.

III. FINDINGS AND ANALYSIS

The next sections reply directly to each of the research questions and their sub-questions. Information from RQ1 is helpful in understanding what elements are important in learning to read in Arabic, in particular and thus in interpreting the actual student achievement data presented in response to RQ2. Below, a brief summary of the student learning outcomes, for context are presented, and then reply to RQ1 and RQ2 in turn.

There is much to be optimistic about in MENA countries' progress in early grade reading and math achievement. While absolute scores are still low, MENA countries have made enormous progress in both EGR and EGM basic skills such as letter sound identification, simple word reading, number identification, quantity discrimination, simple addition and subtraction. However, higher order skills such as oral reading fluency, reading and listening comprehension, number pattern identification, more complex addition and subtraction operations, and word problems have not progressed to the same degree. Scores from other international tests, such as PIRLS, PISA and TIMSS confirm these trends across both subjects.

According to results from multiple administrations of the Early Grade Reading Assessment (EGRA), most of the progress in early grade reading has occurred at the level of phonemic and syllabic awareness and decoding across the MENA Region. EGRA results indicate that all reviewed countries struggled some in decoding words and struggled most in achieving ORF and reading comprehension. On international reading tests, girls consistently outperform boys. This could be related to the varying stages of growth and maturation in girls and boys, or possibly the daily lives of girls versus boys. There is no clear and direct evidence to explain this trend, only possible and/or partial explanations. Likewise, there has been growth in the availability of supplemental reading and math materials, including leveled readers. The Global Book Alliance's Digital Library offers free resources for download in Arabic (<https://digitallibrary.io/ar>), including STEM-focused books as well as story books and readers.

Donor-assisted projects with an explicit focus on early grade mathematics are still in their early stages. EGM is now on the agenda and awareness of the enabling relationship between early grade math and

reading skills is growing (Evans, 2019b). According to multiple EGMA results, progress is lagging in MENA countries, on more conceptual items, such as identifying missing numbers, Level 2 addition and subtraction, and word problems. Pupils from the MENA region tend to perform better on the more procedural items such as number identification, quantity discrimination and addition and subtraction at Level 1. TIMSS results seem to confirm this trend. TIMSS measures mathematical knowledge in three domains: knowing, applying, and reasoning. Knowing covers basic mathematical operations, procedures, etc. Application refers to the ability to apply knowledge and understand problems on a more conceptual level. Reasoning focuses not merely on solving simple problems but on navigating unfamiliar and complex problems that might require multiple steps. In general, the MENA countries participating in TIMSS have made much progress in the knowing domain, but less has occurred in the application domain and even less in the reasoning domain.

Boys' scores on international mathematics tests were generally lower than girls' scores in MENA countries, although in some cases, the gains made by boys were greater than those made by girls, but the girls tended to start with higher scores. As discussed above, there are no definitive reasons given in the discussion of test results for these gender disparities.

Ultimately, MENA region governments and donors want to see more progress on higher order skills—reading fluency and comprehension, solving complex problems, identifying number patterns, level two addition and subtraction. The next section—responding to RQ1—delves into research on teaching and learning reading and mathematics in Arabic, in order to: 1) identify what elements or areas of focus are missing or need more emphasis in the teaching and learning of reading and mathematics in Arabic and 2) generate specific recommendations for consideration by teacher trainers, supervisors, policy makers, curriculum developers, teachers, donor-funded project staff and other education officials, whether in government or the private sector.

RQ1: What do the research-based literature and existing assessment data, say about teaching and learning literacy and numeracy with a variety of learning groups across the Arabic-speaking countries in the MENA region today?

Best practice methods for teaching literacy and numeracy differ significantly due to the inherent differences in the nature of the two skill areas. As presented in a “Meet the Authors” event sponsored by the Global Reading Network to launch the report *Towards the Design and Implementation of Comprehensive Primary Grade Literacy and Numeracy Programs*, intrinsic differences in the nature of literacy and numeracy skill development require different approaches to how lessons are planned and delivered:

In Literacy:

- Domains are nested
- Domains are interdependent and cannot be taught in isolation

In Numeracy:

- Domains are not nested
- Children can develop spatial (geometry) or measurement skills without having developed an understanding of number operations (Evans, 2019a, p. 12).”

Further, literacy skills are tied to the particularities of the language one is learning in; mathematical domains are more universal and consistent across contexts. Language particularities and the nested nature of domains can make the design and planning of literacy lessons quite complex. For example, for language teachers, multiple domains (i.e. phonemic awareness, phonics, listening comprehension, fluency, vocabulary, etc.) need to be taught in mutually reinforcing ways as opposed to discrete stand-alone elements. For mathematics learning, the intrinsic differences in the nature of literacy and numeracy skill development, suggests that mathematic teachers must be well versed in instructional methods across all domains of mathematics as the domains are not as interrelated; thus, poor teaching in one domain can

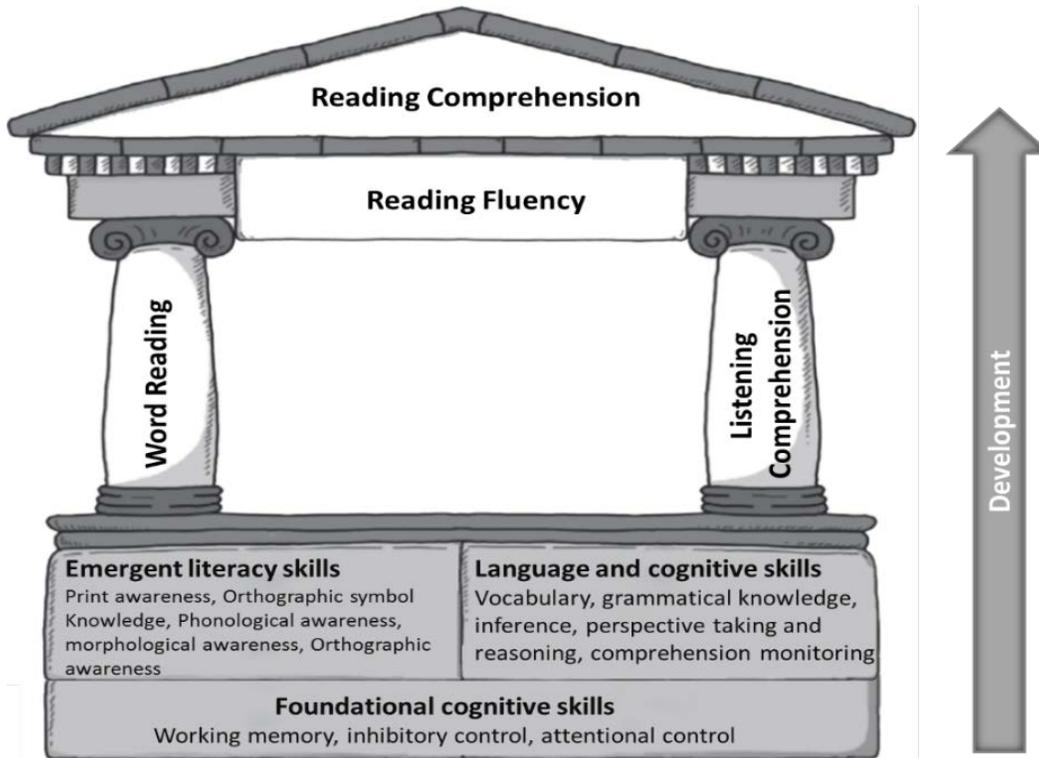
render students deficient in capacity in that domain, with no recourse for reinforcement. Below, are the foundations for and research on acquiring literacy skills and then numeracy skills in Arabic speaking contexts.

RQ 1: FOUNDATIONS FOR ARABIC LITERACY

FINDINGS

Since the publication of the *Topical Analysis on Early Grade Reading Instruction in Arabic* in 2013, new research continues to clarify and expand in greater depth the crucial factors for learning to read in Arabic. This report reviews some of these factors to provide background for examining and better understanding the student outcome trends summarized above and reported in more detail under RQ2, and to highlight areas specific to learning to read and do math in Arabic; where teachers, ministries, projects and donors need to focus in on, in terms of curriculum, instruction, textbooks and assessment. This section begins with a brief discussion of the process and development of skills necessary to read in alphabetic languages, such as Arabic.

Figure 2: Component skills of reading comprehension and their structural relations¹⁵



As Figure 2 illustrates, working memory, inhibitory control, and attention control are foundational cognitive skills in reading and in many other activities. Two groups of higher-level skills build on the foundational skills: emergent literacy skills and language and cognitive skills. Both are essential building blocks in learning to read. The two pillars of reading form from emergent literacy and cognitive skills: word decoding and listening comprehension. Development assistance projects have focused more heavily on the left side of Figure 2, specifically on emergent literacy skills like phonological awareness and phonics and on word reading (decoding). However, listening comprehension is equally important, particularly in a

¹⁵ Reprinted from the Landscape Report on Early Grade Literacy, with permission. Kim (2016b).

diglossic context, where the language of everyday use is different than the language used in reading and writings. There must be equal focus on developing students' listening comprehension skills. Reading fluency depends on both accurate decoding and understanding the language in which one is reading, especially if it is the first language in which one learns to read. The important point here is that decoding does not uniquely support oral reading fluency. ORF is necessary to be able to read with comprehension; students who read slowly and haltingly do not have the working memory to focus on the message—on what is being read—as they are too focused on figuring out individual words. Hence, when a halting reader finishes a sentence, he or she is likely to have already forgotten the first part of the sentence. Some of the significant, recent, and relevant research findings, related to gaps in student capabilities in EGR are presented in the following section. There are several linguistic factors that impact learning to read in any language and are thus important in looking at learning to read in Arabic. These are defined in Figure 3 and in the discussion below.

DIGLOSSIA

The Oxford online dictionary defines diglossia as: “A situation in which two languages (or two varieties of the same language) are used under different conditions within a community, often by the same speakers. The term is usually applied to languages with distinct ‘high’ and ‘low’ (colloquial) varieties, such as Arabic.”¹⁶

The linguistic situation of diglossia across the Arabic-speaking world presents children with a singular difficulty. They learn to talk and think in a local dialect of Arabic, which varies by country, but they must learn to read and write in Modern Standard Arabic, which they learn in school. Indeed, some scholars have posited that MSA is effectively a second language for Arabic-speaking children.¹⁷ Diglossia presents challenges to teachers in choosing the language they use in the classroom and in some cases their own understandings of the complexities of MSA.

As Saiegh-Haddad points out, this diglossic context of high linguistic difference between MSA and the dialects is often characterized by the use of different sounds and words. For example, the words “this” and “that” in MSA are pronounced differently in Moroccan dialect than they are in MSA. See Table 2 below:

Figure 3: Linguistic factors in learning to read

SOUNDS

Phoneme: Any of the perceptually distinct units of sound in a specified language that distinguish one word from another.

Phonetics: classification of speech sounds

Phonological knowledge: ability to recognize the systems of sounds (including or excluding phonetics), within a language or between different languages.

SOUNDS AND SYMBOLS

Phonics Skills: knowledge of the proper correlation of sounds with symbols in an alphabetic writing system

WORDS, SENTENCES, AND TEXT

Lexical knowledge: recognition/knowledge relating to the words or vocabulary of a language.

Morphological knowledge: ability to recognize the forms of words, in particular the word roots and inflected forms.

Orthographical knowledge: recognition and understanding of the conventional spelling system of a language.

Syntactic knowledge: Appreciation of the arrangement of words and phrases to create well-formed sentences in a language.

Semantic knowledge: Ability to derive the meaning of a word, phrase, or text.

Definitions derived from: <https://en.oxforddictionaries.com/> and adapted for this report.

¹⁶ <https://en.oxforddictionaries.com/definition/diglossia>

¹⁷ (Ibrahim, 2005; Leikin, 2014; E. Saiegh-Haddad, 2003; E. Saiegh-Haddad, & Schiff, R., 2016).

Table 2: MSA versus Moroccan Dialect pronunciation of "This" and "That"

	This	That
Arabic spelling	هذه	هذا
MSA pronunciation	/hadhih/	/hadha/
Moroccan dialect pronunciation	/hadi/	/hada/

In Morocco, the /dh/ sound is used less in the spoken language than in Gulf countries, for example. In Morocco the /d/ sound is often substituted for the /dh/ sound in many words. In the words above transliterated into English, the third letter (in red) represented as /dh/ in the MSA words, is pronounced /d/ in the dialect. Indeed, in many common words in Moroccan dialect the /dh/ sound, represented by the Arabic letter ذ is replaced by the /d/ sound. The /dh/ sound is thus unfamiliar to Moroccan children and can cause confusion or error in the proper pronunciation of MSA words; because Moroccan children are less familiar with the phoneme /dh/, they might also have problems recognizing the letter ذ.

Likewise, there are vocabulary words in dialect that are different than those with the same meaning in MSA. Some words are identical, but many used in dialect are cognates of words in MSA and some are completely different. Saiegh-Haddad and Schiff studied the linguistic distance between MSA and spoken Palestinian Arabic and compiled a “pool of 17,500 word tokens collected from 5-year-old native speakers of Palestinian Arabic” and then analyzed a set of 4,500 words of different types derived from the pool. Their study found that “only 21.2 percent of the words in the child’s spoken lexicon were *Identical words*, that is, words that keep an identical lexico-phonological form in SpA [spoken dialect] and StA [standard Arabic or MSA]” (E. Saiegh-Haddad, & Schiff, R., 2016, p. 312). This means that 79 percent of words that children encounter in MSA could be somewhat or very unfamiliar in the language they speak. In Table 3 below it is clear in how different the words are.

Table 3: MSA versus Dialect Vocabulary

MSA Vocabulary	Dialect Vocabulary	Word Meaning	Explanation
غدا /ghadaan/	بكرة /bokra/	Tomorrow	Egypt (completely different)
منزل /manzil/	دار /dar/	House	Morocco (completely different, although /dar/ is also used in MSA).
سمك /samak/	حوت /hawt/	Fish	Morocco; these are completely different words; in MSA /hawt/ actually means whale.
هل تحدث /hal tatahadath... /	بتحكي /btahkee.../	Do you speak...	Palestine; MSA word for “speak” very different from dialect word for “speak”. The root of the verb “to speak” is underlined. Note, the question formation structure is also very different with a formal interrogative in MSA.

In short, when Egyptian children come to school, they have to learn a new word for “tomorrow,” Moroccan children must learn the word /manzil/ for house and /samak/ for “fish” and Palestinian children need to use a more formal interrogation syntax, with the MSA interrogation word /hal/ and learn to use the root word /hadith/ instead of /hakey/ for all forms of the verb “to speak.” While many of the words in dialect that they are familiar with exist in MSA (for example /dar/ and /hawt/), their meanings in context are different in MSA. While students bring with them some MSA vocabulary and syntactical knowledge

from speaking their local dialect, connections and differences between the two need to be pointed out and students' existing knowledge needs to be more explicitly leveraged and supplemented. Hence, diglossia can contribute to vocabulary confusion and often means that children need to learn a new lexicon to read in MSA.

Finally, there are some morpho-syntactical differences between dialect and MSA that can be confusing. Using the case of Morocco again, in the spoken dialect, the prefix to a verb to signal a future tense is *ghada* (from *ghadaan*, which means tomorrow), where as in MSA it is *sawfa*. The subject of the verb is also attached to the verb, along with the tense signifier:

Ghadi i machi ila al souk. I will walk to the market. (*Moroccan dialect*)

Sawfa i machi ila al souk. I will walk to the market. (*MSA*)

Further, in the Moroccan dialect, which tends to eliminate some vowel sounds or elide words together more, one might actually hear:

Ghadi i machi il'souk.

In the Egyptian dialect, the future tense signifier in dialect is closer to MSA but still different. Egyptians use */sa/* not *sawfa*.

Asadi and Khateb assert that, “the literary oral language of Arabic-speaking children is poorly developed when entering school” (Asadi & Khateb, 2017, p. 498). These findings and others beg the question of why children in preschool and the early grades are not more systematically, intensively, and explicitly exposed to MSA through oral readings and through conversation. The findings above also point to the importance of developing listening comprehension skills in MSA, as integral to learning to read in Arabic.

Hence, diglossia does present challenges to students as they start to develop listening comprehension skills and build vocabulary in MSA. It can interfere with comprehension, both listening and reading, as well as discerning proper MSA morpho-syntactic structures. Reading results from EGRA, PISA, PIRLS as well as some of the academic literature suggests that dealing with diglossia and mitigating its effects in the classroom may improve the gaps in students' reading capabilities in Arabic. Moreover, using MSA in the classroom and exposing children to it is a strategy that has shown good results with readers in Arabic (Feitelson, 1993). Pointing out differences in the way something is said in dialect and MSA and pointing out consistent patterns of differences (such as the example of how the future tense is formed in dialect and in MSA, as in the example above) are also instructional strategies that can help children to mitigate the impact of diglossia.

DIACRITICS

The word diacritic (*tashkil*, in Arabic) refers to all of the markings that can appear above and below letters in words to clarify their pronunciation. In a diglossic language such as Arabic, research demonstrates that the use of diacritics can facilitate proper word pronunciation for beginning readers in Arabic. Within *tashkil*, there are short vowel markings called *harakat* that are particularly important in learning to read, because they render Arabic orthographically transparent. In general, student texts in the early grades do use diacritics as a support to emergent reading skills. Generally, researchers credit diacritics with increasing word reading accuracy and comprehension. However, most text in Arabic (newspapers, books, magazines) is unvoiced—that is, does not include diacritical markers. Students are expected to eventually learn to read without diacritics and to rely on other knowledge—syntactic, lexical, morphological—to identify a word. Arabic is a language of homographs--words that are spelled exactly the same and when unvoiced can be indistinguishable, especially when presented as isolated words without syntax and semantic clues help readers to decide which meaning and pronunciation to use. Figure 4 contains four words with no diacritics and Figure 5 contains the same words with the diacritics.

Figure 4: Words without Diacritics

كُتِبَ	كُتُب	ذَهَب	ذَهَبَ
To write/he wrote	Books	Gold	To go/he went

In Figure 4, “to write/he wrote” and “books” look exactly same; a child presented with these words to read or define could correctly answer “he wrote,” “to write” (the infinitive),¹⁸ or “books”. (The dots or points are part of the letters themselves.) This is true with the next words; correct answers could include “gold” or “he went” or the infinitive “to go.”

Figure 5: Words with Diacritics



Source: *Topical Analysis of Early Grade Reading Instruction*, p. 28.

Figure 6: Diacritical Markers



In Figure 5, the vowelized versions of the same words, show that the diacritics distinguish the words. The words “write” and “books” in Arabic have the same dots, but there are additional marks over each of the three letters. See Figure 6 for examples of the diacritical markers. For the word “write,” there are three short /a/ sounds represented by the “fat-ha” symbol over each consonant, indicating that the word is pronounced /kataba/, whereas for the word “books” the diacritics indicate that it should be pronounced kutub, with the “dhamma” symbol for the short /u/ sound over the /k/ and the /t/ and a “sukoon” symbol over the /b/ to indicate that there is no vowel sound after it. The same pattern for “to write” is true with the verb “went” at the far right of the figure above: three “fat-ha” symbols above the three consonants indicate the word is pronounced /dhahaba/; gold, on the other hand, has no third “fat-ha” symbol but rather a “sukoon” over the last consonant, which means it is pronounced /dhahab/.

Recent research has focused more specifically on when diacritics are helpful and not helpful in facilitating pronunciation, fluency and comprehension. Maroun and Hanley reported, “In fact, diacritics increased the amount of time that participants required in order to make decisions about unambiguous words” (Maroun, 2017, p. 329) Likewise, Hussien reports from a study with Grade 5 and 10 students in Saudi Arabia that, “Interestingly and in contrast to improving oral reading accuracy and oral reading comprehension, using visible vowels decelerated oral reading rate and increased the time students spent in oral reading” (Hussien, 2014, p. 64). He attributes this to the fact that reading with voweled script is more “cognitively demanding” for readers, even Grade 5 students. Both studies still confirmed that diacritics were useful in reading ambiguous words (homographs, such as those presented above) and supporting accuracy and comprehension, especially in reading words that can be ambiguous.

¹⁸ Infinitives in Arabic are written as past tense.

By contrast, Saiegh-Haddad and Schiff, in a study that tested the impact of “linguistic distance” or diglossia on reading accuracy and fluency, found, “...the use of diacritical marks to map the word’s phonemic structure, was not found to facilitate reading accuracy in any of the grade levels tested, not even among the youngest second graders” (E. Saiegh-Haddad, & Schiff, R., 2016, p. 319). They acknowledge that these results do not align with previous findings and suggest this could be because they did not include homographic words or morpho-syntactic diacritics in their study, which can impart some syntactic information. However, these findings do raise questions about when to wean early grade learners from diacritics and what is an appropriate correct-words-per-minute (cwpm) benchmark for oral reading fluency in MENA countries. Moreover, these findings also suggest that even within the early grades, students use other knowledge in addition to phonological knowledge to decode connected text. Awareness of what other knowledge areas need to be strengthened and reinforced is key to addressing gaps in students’ reading capabilities.

SYNTACTICAL AWARENESS

Children come to school with knowledge of syntax exhibited through their speech. In Arabic-speaking countries, where children speak a dialect of the language they will ultimately learn to read in, syntactic clues can be important in learning to read connected text well. Awareness of sentence construction is an aid to both decoding—figuring out an ambiguous word by its placement in the sentence—and in word comprehension. This is particularly true for Arabic because of its many homographs and the absence of diacritical marks in the later elementary grades. The context and position of a word in the sentence and the other words surrounding it give readers clues to its role in the sentence and thus its meaning.

Taouka and Coltheart (2004) studied the acquisition of reading skills in Arabic by researching Lebanese Australian children in Grades 3, 4, and 6 in Australia. The researchers found that “as age or level of fluency increases, readers **rely more on sentence context and less on word-final vowels** [emphasis added] to identify the meaning, grammatical function and pronunciation of words” (p. 51). Abdel Bari (2011) explained that using a “sentence approach” to reading instruction helps the beginning reader decode words and sounds in a holistic, contextual way, which he suggested is more relevant to how the brain functions generally. Likewise, Halebah also asserted that the sentence approach is more relevant to learners’ natural inclination to learn from their environment, as they can figure out clues from the sentence context that will lead them to successful reading (Halebah, 2013). These conclusions seem to suggest that an instructional emphasis on reading isolated or decontextualized words, especially with no diacritical markers is not an especially productive activity.

These studies suggest that syntactical knowledge can be an aid to early reading. They do not advocate for teaching complex grammar to Grade 1 and 2 students but suggest building on students’ existing knowledge of syntax and pointing out common sentence patterns as a way to facilitate students’ abilities to derive semantic and lexical clues from sentence contexts.

MORPHOLOGICAL AWARENESS

Arabic words are based on word roots and patterns, using roots that include the addition of affixes such as prefixes, infixes, and suffixes. Some signal the subject of the verb, added to the beginning of the verb in present and future tenses and to the end of the verb in past tense, as well as the object of the verb, added to the end of the very. Possession can also be signaled by suffixes added to end of nouns. Likewise, prefixes, infixes and suffixes also communicate different meanings associated with a common root word.

Most Arabic content words, all verbs, and the vast majority of nouns are made up of two bound morphemes: a trilateral root (e.g., ك.ت.ب /k.t.b/) and word pattern such as /maCCu:C/ [prefix “ma” + 2 consonants + long/u/ + final consonant]. The combinations of the tri-consonantal root

interwoven with the pattern forms produce a specific lexical item, for example مَكْتُوب /maktu:b/(letter).¹⁹

Morphological awareness and knowing word patterns, including the use of prefixes, suffixes, and infixes, is critical to reading in Arabic.²⁰

Table 4 below demonstrates the elements of Arabic morphology, such as root words with three or four consonants, prefixes, infixes, and suffixes that give students critical clues to word meaning and pronunciation and role in the sentence. Below are three Arabic root words: **d r s**, (to study) and the root of words like study, school, lesson; the root **k t b** found in words related to writing; and **t^ʿ b x** (to cook) found in words that have to do with cooking.

Table 4: Elements of Arabic Morphology

English words	Arabic words	Transliteration (Arabic to English letters)	Root Arabic	Root English	Prefix, infix or suffix
School	مدرسة	madrasa	درس	d r s	Prefix /ma/ indicating a place
Teacher (primary)	مدرس (m)	mudaris			Prefix /mu/ indicates one who does or performs +verb
My lesson	درسي	darasi			First person singular possessive suffix
Study	دراسة	dirasa			Short /i/ first vowel; infix of a long /a/ and ta marbuta suffix
We studied	درسنا	darasuna			Suffix /na/ to signal 2 nd person plural and past tense
He writes	يكتب	yaktub	كتب	k t b	Prefix /ya/ to indicate 3 rd person male, present tense
Library	مكتبة	maktaba			Prefix /ma/ to signal a place + fem. ending
Written	مكتوبة	maktuba			Prefix of /ma/ plus infix of long /u/ sound to indicate passive voice and feminine ending
Kitchen	مطبخ	ma t ^ʿ abix	طبخ	t^ʿ b x	Prefix /ma/ to indicate a place where + verb
He cooked	طبخ	t ^ʿ bx			Three letters with short vowels /a/
Cooked	المطبوخ	al mat ^ʿ bux			Definite article (al), prefix /ma/ and infixes /t/ and long /u/ to signal passive voice
Cook/chef	طباخ	t ^ʿ bax			Infix of long a after second consonant signals a person who + verb

In the first row of the first example, the prefix /ma/added to the root **d r s** signals a place, hence /madrasa/ is a place where one studies; likewise, the word kitchen, has the same pattern: the root **t^ʿ b x** plus the prefix /ma/ equals a place where one cooks. For the word “cook” or “chef” the infix of the long /a/ sound, represented by the letter alif indicates one who does something related to the root meaning. Table 4 is not an Arabic language lesson but rather illustrates the multiple aspects of morphological awareness that come into play as emergent readers struggle to make sense of a “new” language and rapidly learn to identify words, especially unvoiced words. The table and discussion also help to put some of the

¹⁹ (Y. Shalhoub-Awwad & Leikin, 2016, p. 297).

²⁰ (Abu-Rabia, 2012; Al Ghanem, 2014; Asadi, Khateb, Ibrahim, & Taha, 2017; H. Boyle, Al Ajjawi, S., & Xiang, Y., 2014; Makhoul, 2017a; E. Saiegh-Haddad, 2003, 2004; Y. L. Shalhoub-Awwad, M., 2016; Taha, 2017).

following research finds into a more concrete context for consideration in developing teaching strategies. Saiegh-Haddad and Geva (2008) asserted the importance of morphological awareness for emergent readers, stating:

...word identification for unvoiced Arabic cannot be successfully accomplished unless the missing phonological information has been recovered by the reader. **One important source of knowledge that helps readers restore the missing phonological information is the word's morphological structure, in particular recognition of the word-pattern** [emphasis added] ...As most of the missing short vowels may be reliably recovered when the reader has identified the word-pattern, becoming aware of the word-pattern should assist readers in their decoding of unvoiced words (Saiegh-Haddad and Geva, 2008, p. 485).

Likewise, Abu-Rabia and Abu Rahmoun reported in 2012 that "...the root morpheme as a semantic entity is helpful and accessible for the initial lexical access, initial understanding and later connected [to] [sic] the rest of the affixes (morphemes) to construct the exact phonological representation (pattern) (Abu-Rabia, 2012, p. 491). Hence, morphological knowledge helps students to unlock semantic knowledge.

Saiegh-Haddad and Schiff explain in their findings that diacritics did not facilitate reading accuracy in any of the primary grades they tested and posit that given the specific features of Arabic, students draw on morphological knowledge:

It may be argued that, equipped with a morphologically organized lexicon, children attempting to discover the systematicity in print discover from a very young age that the letter-based orthographic representation of the word is reliable at the level of the root and the word pattern, so therefore they use this understanding in word reading (Saiegh-Haddad, in press). In support of this claim, first-grade children were found to use the root and word-pattern morphemes in spelling irregular letters mapping emphatic and nonemphatic sounds in Arabic (Saiegh-Haddad, 2013;E. Saiegh-Haddad, & Schiff, R., 2016, p. 320).

Essentially, they are saying that morphological knowledge contributes to decoding, oral reading fluency, and semantic understanding of text.

In their 2016 study, Shalhoub-Awwad and Leikin examine the effects of morphological knowledge on visual word recognition of the Arabic root among young readers, with the goal of better understanding the role of the root in learning to read and "its development within the structure of the Arabic mental lexicon" (p 304). They found that "...previous exposure to a word that shares the same root with a target word could speed up the identification of the target word and improve its level of accuracy" (Y. L. Shalhoub-Awwad, M., 2016, pp. 304-305). The researchers also found that reaction times and error rates among Arabic speaking students in the study were slower than those of Hebrew readers, confirming previous studies which asserted that the process of reading acquisition in Arabic is slower than in other languages due to specific characteristics of the language itself and the script.

In terms of the development of a mental lexicon, the study found that "the root morpheme speeded up the RT [reaction time] in the word recognition process in the reading acquisition stage (second grade)..." and that "developing readers rely on morphemes while processing morphologically complex words as early as second grade" while "more proficient readers (fifth graders) who already attained the orthographic recognition stage and have an expanded mental lexicon (due to the development of their linguistic knowledge and reading experience), leans [sic] less on the root morpheme than novice readers" (Y. L. Shalhoub-Awwad, M., 2016, p. 305).

These findings certainly suggest that phonological skills, while important, are not sufficient for emerging Arabic language readers. Shalhoub-Awwad and Leikin critique previous theories noting: "It seems that the phonological recoding that provides opportunities to learn word-specific print-to-meaning connections (Share, 1995) is not sufficient for the novice Arabic reader, due to the lexical/phonological distance

between the spoken and written language, which hinders these opportunities” (2016, p. 306). They also critique the Ziegler and Goswami’s psychological grain size theory (2005), which argues that differences in reading abilities across languages “reflect fundamental differences in the nature of the phonological recoding and reading strategies that are developing in response to the orthography” (p. 19), asserting that **“It is likely that the novice Arabic reader needs an additional reading strategy, the root morpheme, due to the lexical/phonological distance between the spoken and written Arabic [emphasis added]”** (2016, p. 306).

The authors point out that their findings have implications for instruction: “One pedagogical implication that may follow our findings is the need for direct instruction of morphological knowledge in elementary school by raising awareness to the meaning of linguistic derivation of the root morpheme and by exposure to it” (Y. L. Shalhoub-Awwad, M., 2016, p. 307). Likewise, Mahfoudhi (2010) et al. made a similar suggestion almost a decade earlier, saying that:

...one potential role might be the use of morphological unpacking strategies to support word identification and the determination of meaning. For example, the root can be used to support the identification of the item within a word lexicon and, thereby, determine word-level meaning. (Mahfoudhi et al.)

Lastly, and in relation to incorporating some focus on morphological awareness more directly into early grade instruction, Saiegh-Haddad and Schiff report that there are orthographical benefits that come from morphological knowledge: “Moreover, Arabic spelling, even in young children, was found to benefit from morphological awareness and morphological intervention (Taha & Saiegh-Haddad, 2015, 2016; E. Saiegh-Haddad, & Schiff, R., 2016, p. 320).

Overall, these findings have important implications for learning to read in Arabic, suggesting that phonetic decoding—skills that are highly emphasized in donor-funded reading initiatives in the Arabic speaking world and advocated for by Ministries—are incomplete in terms of what needs to be considered. Further, they suggest that an explicit focus on expanding and reinforcing morphological awareness is important in learning to read in Arabic. Research suggests that there is a gap between these findings and their implementation in instructional content and strategies in early grade classrooms in the MENA region.

READING COMPREHENSION

Reading comprehension has not improved as rapidly or consistently in Arabic speaking countries and is a serious “gap” in student learning, as reported below. As illustrated in Figure 2 above, comprehension, the ultimate goal of reading, rests on the “cross bar” of fluency, supported by the pillars of sound decoding and listening comprehension skills. There are several characteristics of the Arabic language itself that complicate the development of decoding and listening comprehension skills and thus the development of good oral reading fluency skills.

All the factors discussed above impact students’ ability achieve reading comprehension. Further, gaps in how these factors are mitigated and/or taught in early grade classrooms in Arabic speaking countries directly impact the development of reading comprehension skills. Hence, strategies to improve comprehension rest on developing clear and direct instructional strategies and accompanying materials to use with early grade students.

In a study that included 166 Kuwait public school children in Grades 3 through 6, as well as 86 children with learning disabilities from the same grades, Mahfoudhi et al. (2010) examined the role of morphological awareness in comparison to phonological awareness to see how these variables impacted students’ comprehension. In the discussion of their findings, the authors state:

...these data suggest that in comparison with each other, phonological skills and morphological ability explain unique, independent variability in comprehension levels in this mainstream Arabic-speaking cohort of children. Those with good phonological and good morphological skills are

more likely to show better reading comprehension levels (Mahfoudhi et al., 2010, pp. 509–510).

Comprehension strategies can be more difficult for teachers to incorporate into their lessons and they often involve instructional configurations that are harder for teachers to manage such as pair work, group work, silent reading, modeling their own comprehension strategies, which they might not feel confident about, going into inferred meaning, etc. Yet, strategies to increase reading comprehension must be incorporated into teaching of reading as they are critical to students' reading development.

ARABIC INSTRUCTION

Lastly, Faour, in *The Arab World's Education Report Card* from 2012, concludes that, "Unfortunately, in the Arab world many teachers are underprepared. They neither have college degrees nor teaching certifications" (Faour, 2012, p. 9). He questions, "How can a teacher with limited knowledge of a subject impart accurate and rich information on that topic to students to promote their critical thinking (Faour, 2012, p. 9)." Reading in and of itself is the application of many thinking skills. If Arabic teachers are only prepared to recite materials and have student memorize and recite passages to pass exams, by implication they are not prepared to teach reading. In summary, educators need to reconsider how Arabic literacy skills are taught in the early grades (Faour, 2012; Taha, 2017). Taha likewise comments that "Covering the textbook content, memorizing grammar and spelling rules, and content review seem to be the goal of most [Arabic] teachers in public school systems in the Arab world...(Taha, 2017, p. 271)." Taha further points out that the 2014 *Arab Knowledge Report* cited eight challenges the Arabic speaking world will need to address to create a knowledge economy and knowledge society. One particular challenge he cited was "a rigid look at the Arabic language and how it is taught (Taha, 2017, p. 271)." There needs to be more deliberate teaching of lexical knowledge, morphological knowledge, orthographical knowledge, syntactic knowledge and semantic knowledge but not in a grammar-centric manner. Children come to school with knowledge of their dialects of Arabic and this knowledge needs to be better leveraged as they learn to read. Children need to be more consistently exposed to MSA in the classroom by their teachers using MSA and not frequently lapsing into dialect (Feitelson, 1993; Iraqi, 1990; Taha, 2017); however, similarities and differences between MSA and dialect need to be pointed out to them by the teacher.

In mid-to-later elementary school, children receive a good amount of instruction in Arabic grammar. However, teaching methods have not been updated and are often not linked to the teaching of literacy. Grammar as it is taught is often very abstract and rote-oriented. Taha points out in relation to Arabic teachers, They are the outcomes of educational systems that expect them to reach from prescribed grammar-based textbooks that are outdated, boring, and unresponsive to student needs (Taha, 2017, p. 271)." In addition, children do not get enough independent reading time and there is too little focus on the teaching of comprehension skills and on writing for expression.

Overall, Taha (2017), Faour (2012) and Taha-Thomure (2008) and others point out that challenges to Arabic teacher quality include poor teacher-preparation programs, a theoretical pre-service curriculum where practice is relegated to the latter years of the program and is insufficient in terms of depth and duration (Bahrain being one exception), lack of balance between Arabic language content and pedagogical skills, absence of teacher induction programs and absence of meaningful ongoing or in-service professional development. While these challenges are common across subjects, Taha points out that strong skills in Arabic language are critical in "the knowledge age" because if students have "poor language proficiency, they will not be able to carry out those 21st century functions that are critical (Taha, 2017, p. 270)" such as accessing knowledge, assessing, analyzing and creating new knowledge.

FOUNDATIONS FOR TEACHING AND LEARNING EARLY GRADE MATH

The report *Early Primary Mathematics Education in Arab Countries of the Middle East and North Africa* (Matar, 2013) examined EGM teaching and learning in the MENA region and states that "Almost all early-grade math curricula in the region share the same content domains including numbers, geometry, algebra,

measurement, and probability and statistics, although with different levels of emphasis (Mullis et al., 2012b)(Matar, 2013 p. 11 p. 11).” The report likewise states that in some countries, the curriculum has not been updated in several years. This report mirrors the National Council of Mathematics, which similarly defines five “content standards” for mathematics instruction in the early grades. These are:

- Number & Operations
- Algebra
- Geometry
- Measurement
- Data Analysis & Probability (<https://www.nctm.org/Standards-and-Positions/Principles-and-Standards/Principles,-Standards,-and-Expectations/>).

While in reading instruction, there are content areas (phonemic awareness, phonics, vocabulary, fluency and comprehension), differences in language structures make the actual content to be organized and taught very language and context specific (e.g. the notion of words that rhyme, for example, are very different in Arabic and English). In mathematics, number operations, algebra, geometry, etc. work in pretty much the same way across linguistic groups and cultural contexts.

Hence, best practices in mathematics instruction are generally more uniformly applicable—needing less adaptation than reading best practices—across contexts. Matar cites the National Research Council (2001) in naming five areas of proficiency that form the backbone of sound pedagogical practices in mathematics: “(1) understanding, (2) computing, (3) applying, (4) reasoning, and (5) engaging (Matar, 2013 p. 15 p. 15).” Likewise, the National Council of Mathematics more recently articulated five “Process Standards” which describe transversal skills critical to learning the content, which are developed through excellent instruction. These are:

- Problem Solving
- Reasoning & Proof
- Communication
- Connections
- Representation (<https://www.nctm.org/Standards-and-Positions/Principles-and-Standards/Principles,-Standards,-and-Expectations/>)

In terms of the process standards, instruction must enable students to practice/utilize the following skills within each process area. See Table 5 below.

Table 5: Process Standards

Process Standards	Skill areas through which to teach content and around which to plan lessons
Problem Solving	<ul style="list-style-type: none">• Build new mathematical knowledge through problem solving• Solve problems that arise in mathematics and in other contexts• Apply and adapt a variety of appropriate strategies to solve problems• Monitor and reflect on the process of mathematical problem solving
Reasoning and Proof	<ul style="list-style-type: none">• Recognize reasoning and proof as fundamental aspects of mathematics• Make and investigate mathematical conjectures• Develop and evaluate mathematical arguments and proofs• Select and use various types of reasoning and methods of proof
Communication	<ul style="list-style-type: none">• Organize and consolidate their mathematical thinking through communication• Communicate their mathematical thinking coherently and clearly to peers, teachers, and others• Analyze and evaluate the mathematical thinking and strategies of others;• Use the language of mathematics to express mathematical ideas precisely.
Connections	<ul style="list-style-type: none">• Recognize and use connections among mathematical ideas• Understand how mathematical ideas interconnect and build on one another to produce a coherent whole• Recognize and apply mathematics in contexts outside of mathematics
Representation	<ul style="list-style-type: none">• Create and use representations to organize, record, and communicate mathematical ideas• Select, apply, and translate among mathematical representations to solve problems• Use representations to model and interpret physical, social, and mathematical phenomena

Source: <https://www.nctm.org/Standards-and-Positions/Principles-and-Standards/Process/>

The foundations of sound mathematics instruction are built around the creation of structured and well sequenced opportunities for students to attempt/practice/perform the skills in the column on the right above. However, teachers are often not skilled at facilitating these sorts of learning activities in the classroom (Faour, 2012; Taha-Thomure, 2008) because their training does not prepare them to do so.

MATHEMATICS TEACHER QUALITY, PREPARATION AND TRAINING

Faour, in *The Arab World's Education Report Card* from 2012, examined the overall issue of school climate, including factors impacting teaching and learning and interpersonal relationships in the school, particularly in relation to mathematics (and science) teachers in the Arabic speaking world. Using TIMSS data from 2007, he points out that a huge majority of mathematics teachers at the Grade 8 levels in Algeria, Morocco and Syria did not have university degrees and the same was true for a large percentage in Lebanon and Tunisia as well, while pointing out that except for Dubai, the percentages of Grade 4 mathematics teachers who had any professional development was below the international average of 30 percent.

Faour also examined working conditions for teachers, citing evidence that teachers performed better when working conditions were better. In Algeria, Morocco and Yemen, “the percentage of students [4th grade] whose teachers had a high index of working conditions was significantly below the international average (Faour, 2012, p. 12).” Moreover, “only a small percentage (between 5 and 11) percent) of fourth grade students in five out of seven participating Arab countries had mathematics teachers whose perceptions of school climate were positive. Thus, TIMSS results show the prevalence of negative perceptions of school climate among a majority of mathematics teachers in the Arab world (Faour, 2012, p. 15) Low satisfaction also leads to increased teacher absenteeism. Faour further reports, in relation to mathematics teaching, “in most Arab countries, the activities teachers use to improve students’ problem-

solving abilities in mathematics emphasize memorization of formulas and procedures and do not promote a true understanding of the principles involved (Faour, 2012, p. 15).” Likewise, assessment practices in mathematics typically rely on “recall of facts and procedures always or almost always (Faour, 2012, p. 16).” Finally, Faour developed a composite index of school climate based on TIMSS data, including only variables that had a significant association with mathematics achievement. The index included safety, teachers’ professional development, teachers’ working conditions, students’ learning methods, learning resources available and parental involvement. Using his composite index, Faour concluded that of the 14 countries that participated in TIMSS in 2007, all but two had a negative climate index. The two that had a positive index were Dubai and Lebanon, both with a large percentage of private schools that follow international standards (Faour, 2012, pp. 26-27).

EGM assessment activities, under overall project intervention in Egypt and Jordan, provide information on gaps in student performance, suggesting that these are areas where teachers need additional capacity building. The Egypt EGMA report identifies the following areas as gaps in student performance in math:

- Automaticity in completion of basic addition and subtraction tasks especially with numbers larger than single digits
- Comparing quantities or filling in patterns
- Word problems that require adding two single-digit numbers

The Egypt EGMA findings indicate that students are not receiving adequate instruction in these math skills and they need more opportunities to practice and build automaticity in these skill areas. However, the Egypt 2015 EGMA study assessed and reported that teachers were set of good instructional practices. Most math teachers observed during the study provided an outline of their lesson to their students and explained what they would be studying. Teachers modeled problem-solving skills for their students and provided opportunities for their students to practice the skill. Further, teachers gave explanations when students offered incorrect responses to a question that had been asked. The report stated that teachers were keen on students’ involvement in the instructional activities. The classroom observation indicated that students used their textbooks but reported limited use of other teaching aids or supplementary materials. Finally, in the Egypt EGMA study, math teachers reported that limited effective follow up visits were held to help them to follow up on the trainings they received. Further, teachers suggested that revised editions of textbooks and trainings would lead to improved instruction. They also felt that school- and classroom-based support to teachers would reinforce the effective teaching practices and consequently students’ learning gains.

The 2012 Jordan EGM assessment results indicate that intentionally structured teaching around evidence-based best practices can address some of the problems noted above and lead to improved learning outcomes in math. When teachers provided deliberate, structured, and developmentally appropriate practice in foundational skills for both reading and mathematics, student performance improved significantly. Also, when teachers are introduced to more effective pedagogies and use them consistently as part of a structured routine, they see positive impacts on students’ performance. In Jordan, teachers were asked to implement a limited number of carefully structured routines on a daily basis and they saw positive outcomes. However, while teachers reported positively on the intervention, the assumption that teachers would incorporate the approach in their daily classroom teaching was not confirmed, as it was viewed as “additional work”.

The 2012 EGM study in Jordan also identified a set of characteristics for effective math teachers. Effective math teachers were more likely to use homework and worksheets as assessment methods for their students; they tended to use constructive responses rather than punitive responses when students made an error. Parental involvement was recognized as important for supporting learning outcomes. The study also reported that good classrooms received more frequent teacher supervisor support visits and school leadership had an instrumental role in providing a supportive learning environment.

SYNTHESIS OF RQI FINDINGS

RQ1: What do the research-based literature and existing assessment data, say about teaching and learning literacy and numeracy with a variety of learning groups across the Arabic-speaking countries in the MENA region today?

Research based literature and assessment data suggest that there is room for improvement in how both literacy and numeracy are taught. It is important to preface this synthesis by pointing out the critical differences in teaching literacy versus teaching numeracy. Overall, teachers in the MENA region are not well prepared to teach either subject (Faour, 2012), but particularly Arabic (Taha, 2017). The methods for teaching literacy and numeracy also differ significantly.

The first sub-question deals with Arabic and findings are summarized below:

- What does the research on learning to read in Arabic—particularly the large body of research carried out by academics in the region—tell us about what works and what skills and sub-skills should be emphasized in Arabic reading improvement programs?

Recognizing word roots (morphology) are important in learning to read in Arabic and this skill needs to be more explicitly taught and not from a grammatical perspective. The same is true in recognizing sentence structures and patterns in Arabic. Verbal and nominal sentences are generally taught; however, the use of context clues that are inherent in each type of sentence should be better taught to aid comprehension. Traditional, rote methods of teaching Arabic are still in use and need to be modernized and adapted better to primary school-aged children (Taha, 2017). Arabic language teacher preparation, although evolving, is still weak and in many cases the lowest performing students in teacher preparation programs are funneled into Arabic teaching (Taha, 2017, p. 275).” Furthermore, teachers receive inadequate field experience in pre-service training and insufficient ongoing professional development in teaching Arabic once they are in the classroom.

- What does the research on learning numeracy in Arabic tell us about what works and what skills and sub-skills should be emphasized in numeracy improvement programs?

Higher order skills are less emphasized by teachers and need to receive increased focus in the classroom. Variables related to school climate impact mathematics teachers (and probably others) and this in turn impacts student learning. Teaching is still somewhat rote, based on the memorization of formulas, lacking an emphasis on ensuring an understanding of mathematical principles.

- What are the missing resources that continue to inhibit EGR and EGM students to succeed in reaching literacy and numeracy benchmarks?

Students need teachers who use MSA in the classroom. They also need time to actually read—to do independent reading and to read silently in class. Developing fluency and comprehension as a reader requires practice. Reading is not a theoretical exercise—it is a practical skill. In mathematics, students would benefit from more hands-on activities and the availability of manipulatives in the classroom to work with. Finally, in both subjects, students need instruction that focuses on problem solving—whether the use of inference in reading or examining multiple ways to solve mathematics problems.

- What approaches to teacher training can be adopted/tailored for teachers of Arabic reading and numeracy? (e.g. pre-service, in-service, praxis)

Overall, teachers need more training in designing student-centered, active learning lessons in both literacy and math. In reading, teachers need to understand the importance of using MSA in the classroom and training in how to plan lessons that use MSA throughout. They need training in mitigating the impact of diglossia through the judicious use of translation when needed and drawing students’ attention to similarities and differences between their dialect and MSA. Teachers also need more training in doing read-alouds in MSA. Teachers need additional training on how to teach, using both inductive and deductive

methods, morphology and semantics (recognizing word roots and word patterns) as well as syntax (recognizing and using sentence structure for discovering meaning); likewise, they need training in how to explicitly teach comprehension skills including the use of context clues.

In mathematics, teachers need more training in how to structure lessons that focus on higher order mathematical skills. This could include content reinforcement in the areas of word problems and, number pattern identification and more complex addition and subtraction operations.

RQ 2: CURRENT EGR AND EGM PERFORMANCE IN MENA COUNTRIES

FINDINGS

EGRA RESULTS: COUNTRIES WITH MULTIPLE ASSESSMENTS

Overall, there has been notable progress in reading results in the MENA region over the last five years. The tables below present baseline and subsequent EGRA results for countries with two or more EGRA administrations – Egypt, Jordan, Morocco, Yemen, Lebanon and the West Bank.

Egypt

Egypt was one of the earliest countries to use the EGRA tool to assess reading levels in primary school. Thus, Egypt has EGRA results from 2009 through 2019, although under different projects and with different groups of children.

The scores in letter sound identification show a steady upward trend in items correct per minute, especially for the treatment group between 2009–2011; there was also growth in this area between 2013 and 2014 and results in 2015, although a little lower than 2014, were still in a consistent range. This same trend is true for decoding unfamiliar words between 2009 and 2011 for the treatment group, and there is very slight progress between 2013 and 2014 for Grade 2 and Grade 3 students in this subtask. However, baseline scores for the 2015 EGRA show a lower starting point in decoding unfamiliar words than in earlier EGRAs. Overall, results for decoding unfamiliar words have not improved substantially over time and indeed, have declined in the 2015 EGRA baseline. Oral passage reading with diacritics was also an area that saw substantial and consistent improvement. Indeed, the percentage of improvement between 2009 and 2011 on these three subtasks was extremely high. These results indicate good progress on the skills that have received focus from the MOE in the past, and lower progress on skills that are important but have received less focus from the MOE since the initial implementation of the MOE’s Reading Program. This kind of mixed progress is expected in the early stage of an annually-expanding national program, and where some skills have received more emphasis over more time than others.

For the Literate Village project, the same students were tested in Grades 2 and 3, which is a variation on how other EGRAs were administered in Egypt, where Grade 2 and 3 students were tested simultaneously. Additionally, the Literate Village project added some items to the EGRA tool including subtests for compound letters, word sound differentiation (beginning), word sound differentiation (end), decoding familiar words, and accuracy (percent of words read correctly in the oral reading passage subtest).

In all cases the percentage of correct responses increased from Grade 2 to Grade 3. There are a couple of anomalies worth noting. First, the percentage of correct answers for listening comprehension and reading comprehension increased quite a bit, especially for the former. Interestingly, though, the word sound differentiation, decoding unfamiliar words and oral passage reading, while improving, did not improve by a large percentage. The reading comprehension increase seems counterintuitive, given the importance of phonemic awareness and phonics skills in reading. However, it could suggest, as some of the research presented above suggests, that children rely on context clues and other language-embedded clues—syntactical, morphological knowledge—to help them read as they progress through school. Also,

of note, while Grade 3 pupils got an average of 65 percent of responses correct identifying letter sounds, for all of the other tasks, the average percentage of correct replies was consistently under 50 percent. The project's approach to facilitating comprehension skills, however, might merit further study.

Table 6: Egypt EGRA scores (2013, 2014, 2015, 2017, and 2019)

EGRA Subtasks	Egypt GILO Project						Egypt (n=1,992)		Egypt (n=1,923)		Egypt (n=3,520)				Egypt Literate Village Project****	
	2009/2011						2013		2014		2015				2017	2019
	Treatment 2009 Avg. scores Grade 2 (N=444)	Treatment 2011 Avg. scores Grade 2 (N=465)	% Change	Control 2009 Avg. scores G2 (N=465)	Control 2011 Avg. scores G2 (N=444)	% Change	G3 % scoring 0	G3 Avg. score	G3 % scoring 0	G3 Avg. score	G2 % scoring 0	G2 Avg. items correct/minute	G3 % scoring 0	G3 Avg. items correct/minute	G1/2 % correct*	G2/3 % correct*
Identifying Letter Sounds (out of 60 letters with diacritics) *(out of 50 letters with diacritics)	6.76 clpm	47.28 clpm	+192%	8.55 clpm	10.10 clpm	+18%	18.3%	18.8	11.4%	27.7	27%	19.0	21%	22.5	35%	65%
Compound letters														18%	34%	
Word sound differentiation (beginning)														14%	18%	
Word sound differentiation (end)														14%	16%	
Decoding familiar words														7%	18%	
Decoding Unfamiliar Words	37.0	50.11	+111%	5.56	7.45	+34%	27.4%	5.8**	25.9%	7.5	47%	4.3	41%	5.4	2%	6%
Oral Passage Reading with diacritics		14.21	+91%	8.92	10.93	+23%	21.6%	21.9	27.3%	20.7	43%	10.6	30%	18.5	20.8	25.2
Accuracy (% of words read correctly)														36%	44%	
Reading Comprehension with diacritics							35.4%	1.9 3.2	43.3% 36.9%	1.3 3.6	62% 57%	12.3% 15.0%	49% 44%	22.9% 26.9%	29%	39%
Listening Comprehension							13.3%	3.6	28.6%	3.2	33%	34.2%	24%	34.7%	8%	39%

*clpm=correct letter sounds identified per minute

**cwpm=correct words read per minute

***Proposed task in 2013 was 14 cwpm= correct words per minute

****This EGRA used some different measures than the traditional EGRA used previously. Hence, some rows only have scores for the Literate Village Project. It should be noted for the Literate Village (far right) results, the report does not do a good job of distinguishing the gains in all categories between the intervention group and the midline group. In many cases, the intervention and midline scores seem to be aggregated. The report distinguishes between sex, grades and location for statistically significant results but does not break these down by intervention and subgroup, except for aggregate tables, only reporting that the differences between the average results of the intervention and comparison groups were across the board were not statistically significant. They do report a moderately significant difference in aggregate % gain between the intervention and control groups from baseline to midline but only report this as an aggregate score with the intervention group gaining an average of 32% and the control group gaining 40%.

Jordan

The Jordan EGRA demonstrates slow but consistent progress across the EGRA subtasks, except for Grade 3 oral passage reading (fluency), which dropped by approximately three words per minute in 2017. Reading comprehension is also very low.

Table 7: Jordan EGRA scores (2014 and 2017)

EGRA subtasks	Grade 2	Grade 2	Grade 3	Grade 3
	2014	2017	2014	2017
Identifying Letter Sounds (from 100 letters)	38.2 clpm	47.3 clpm	35.7 clpm	48.6 clpm
Syllable sounds (out of 50 syllables)	22.1	29.8	28.7	33.8
Decoding Unfamiliar Words (out of 50 nonwords)	7.1 wpm	10.8 wpm	10.9 wpm	13.7 wpm
Oral Passage Reading with diacritics	19.1 wpm	21.4 wpm	35.0 wpm	31.7 wpm
Reading Comprehension (out of 6 questions)	7.9%	11.4%	29.0%	31.5%

**Blue highlight denotes results that are mixed, static, or declining*

Although there were increases between pre- and post-test scores for both grades, Grade 3 students are still correctly answering only about one-third of the comprehension questions. Interestingly, Jordan has made a great effort in recent years to ensure that children attend some form of preschool. The World Bank reports that “Jordan has the highest rate of children engaged in childhood development activities (82 percent) in the region, but less than a quarter (22 percent) of children attend Early Childhood Care and Education (ECCE)” (The Jordan Times, 2017). However, most of the engagement with pre-primary level children is in the health sector, rather than the education sector. The Jordan Times reported that “the Ministry of Education and UNICEF are embarking on an ambitious eight-year plan (2017-2025) to ‘universalize access’ to pre-primary education in the country with a budget of \$198 million.”

This same article reported that UNICEF Jordan estimates that “close to 59 percent of the estimated 153,000 five-year-old children in the Kingdom are already attending kindergarten, but significant disparities persist between geographic regions and socioeconomic groups” (The Jordan Times, 2017). UNICEF’s webpage and 2015 report on Early Childhood Care and Education confirms the Times’ reporting (UNICEF Jordan, 2017). In a 2015 study of curriculum activities in Jordanian preschools, Ahmad noted that there is a high focus on academic preparation in these schools, including early literacy and math skills (Ahmad, 2015). He says that, “...children spent most of the time learning Arabic and the least time learning scientific concepts” (Ahmad, 2015, p. 187). Ahmad also noted that teaching methods seemed to align with best practices and that some preschools also offer some support for literacy in English, but not to the same degree as Arabic. If 59 percent of preschool age children attend preschool, this might contribute in part to the relatively high scores in identifying letter sounds and syllable sounds.

Morocco

The baseline EGRA scores from the May 2016 Morocco Reading for Success (RFS) project in Table 8 below reveal uniformly low scores across both the treatment and the control groups, lower than those from the 2011 EGRA. The scores across both groups in 2016 are consistently very close, indicating both groups are at approximately the same level. For the subtasks that are comparable, the 2011 cohort of Grade 2 students in Doukala-Abda could decode ten words in one minute, while the two groups in the 2016 EGRA could decode 6.8 (control) and 7.31 (treatment), respectively. Listening comprehension and oral reading fluency scores were also higher in 2011 with the Doukala-Abda cohort and even the reading comprehension scores were slightly higher than those found in the 2016 RFS baseline. The two EGRA baseline administrations in Morocco demonstrate that scores have been consistently low between 2011 and 2016. Therefore, the gains that occurred as the RFS project and the Ministry of National Education

and Vocational Training (MNE) developed and piloted new reading materials are quite encouraging.

Table 8: Morocco EGRA scores from Doukala-Abda region (2011)

EGRA subtasks	% students with zero score			Average scores		
	Grade 2 (n=382)	Grade 3 (n=390)	Overall	Grade 2	Grade 3	Overall
Letter-sound knowledge	18%	8%	13%	23.0 clpm*	33.0 clpm	28.0 clpm
Decoding of invented words	34%	17%	25.5%	10.0 cwpm**	15.0 cwpm	12.5 cwpm
Listening comprehension	18%	10%	14%	38% (2.3/6)***	57% (3.4/6)	48% (2.9/6)
Oral reading fluency	33%	17%	25%	16 cwpm	27 wpm	21.5 cwpm
Reading comprehension	62%	39%	50.5%	12% (0.7/6)	25% (1.5/6)	18% (1.1/6)

*clpm = correct letters per minute

**correct words decoded per minute

***average number of questions answered correctly out of a total of 6 questions.²¹

A midline assessment was administered under the RFS project in September 2016 and in the short period between baseline and endline, there were substantial gains in both the treatment and control groups. Although the treatment group exceeded the control group in phonemic awareness gains, the gains were generally similar between the baseline and midline for the two groups. Of note, neither group made large gains in listening comprehension nor in reading comprehension; in fact, both groups were virtually static. The endline assessment was administered one year after the midline assessment in September 2017. (The endline report did not include standard deviation and range figures, hence they are not included in Table 9 below.) Endline results for the first cohort were also encouraging.

²¹ RTI International (January 2012). Student Performance in Reading and Mathematics, Pedagogic Practice, and School Management in Doukkala Abda, Morocco (EdData II Task Order No. 7). USAID: Washington, DC. Retrieved from: https://www.globalreadingnetwork.net/sites/default/files/eddata/ACL_Technical_Country_Brief_Morocco_FINAL_26_Nov1.pdf

Table 9: Morocco EGRA scores for the RFS-SSE project, (baseline, midline, and endline)

Task Areas (N=1,577)	Baseline Mean Score	Midline Mean Score	Endline Mean Score	Gain, Midline to Endline	Gain, Baseline to Endline***
Phonemic Awareness	Students were asked to identify the initial sound of 10 words.				
Control (N=799)	3.3	4.89	6.27	1.67*	2.97
Treatment (N=778)	3.15	6.19	7.25	1.73*	4.10
Syllable Identification**	Students have 1 minute to pronounce 100 letter items with diacritics.				
Control (N=799)	22.90	37.09	52.50	23.99* **	29.60
Treatment (N=778)	23.48	37.60	55.23	26.48* **	31.75
Non-Word Reading	Students were given 50 non-words with diacritics to read aloud				
Control (N=799)	6.80	11.52	17.00	9.18*	10.20
Treatment (N=778)	7.31	11.41	17.48	9.50*	10.17
Oral Reading Fluency	Students were asked to read aloud a text of 59 words accurately in 1 minute				
Control (N=799)	5.5	11.52	5.69	18.31*	20.19
Treatment (N=778)	5.94	11.41	26.31	19.15*	20.37
Reading Comprehension	Based on how far they got in reading the passage above, students were asked to answer up to five comprehension question; they were not questioned on parts of passage they did not get to in the oral reading.				
Control (N=799)	.37	.36	1.09	.41*	.72
Treatment (N=778)	.38	.31	1.09	.46*	.71
Listening Comprehension	Students listened to a story and were then asked 5 questions about the story.				
Control (N=799)	1.14	1.59	2.56	.67*	1.42
Treatment (N=778)	1.12	1.75	2.66	.76*	1.54

Note: Blue highlight indicates the baseline scores that can be roughly compared to the 2011 EGRA scores.

*The average score difference between the two groups from midline to endline was statistically significant ($p < 0.05$).

**Average gain scores for the treatment and control group were significantly different from mid-line to endline at ($p < 0.05$)

***The endline report did not contain analysis on statistical significance in average scores or average gain scores from baseline to endline.

At endline, students in the treatment group more than doubled their scores in phonemic awareness and outpaced the control group by one item. On average, they were able to correctly identify more than two-thirds of the ten items correctly by endline. The treatment group almost tripled their scores in syllable identification between baseline and endline. While gains were significant across all tasks from midline to endline, the nonword reading, oral reading fluency, reading comprehension, and listening comprehension scores suggest more work is necessary. With the gains made in phonemic awareness and syllable identification—skills integral to nonword reading—students in both the treatment and control groups could not sound out or read even half of the 50 nonwords. They made significant gains in oral reading fluency but on average, it appears most were able to read slightly less than half of the passage in the time allotted by the endline measure. Reading comprehension was particularly low—most only correctly answered just over one of the five comprehension questions, although they performed better on the

listening comprehension task, answering over half of the questions correctly.

Yemen

Across the board, Yemen’s EGRA subtask performance in 2012 was very low. Students in Grades 2 and 3 were able to name 17 and 22 letters out of the 28 letter Arabic alphabet, but only 10 percent of students were able to correctly identify the sounds that initial letters represented in words; likewise, in both grades, students correctly identified an average of only five letter sounds in one minute. There were high percentages of students with zero scores (i.e. the percentage of pupils who answered zero questions in a subtask correctly) in reading comprehension. Surprisingly, familiar word reading scores were slightly better than some of the other subtasks’ scores, which could result from the historical use of the “whole word” method of teaching reading in Yemen and elsewhere in the Arabic speaking world (H. Boyle, Al Ajjawi, S., & Xiang, Y., 2014), it could also be that students simply recognized the words by form. The Education for Data Decision Making (EdData) II study found that students from Amran, Lahj, and Sana’a did not acquire the necessary foundational skills to read and understand in Modern Standard Arabic (MSA). Furthermore, the study reported that although students identified letters, they struggled with letter sounds and overall did not have sufficient vocabulary in MSA, therefore they struggled to decode familiar words (RTI International 2013). RTI also reported that students’ listening comprehension was very low: 53 percent of Grade 2 students and 30 percent of Grade 3 students were not able to answer even one question correctly on a story read aloud to them.

Table 10: Yemen baseline EGRA scores (2011)

EGRA subtasks	% Students with zero scores	Average of correct scores of “readers” (students with scores higher than zero)	
		Grade 2	Grade 3
Letter name knowledge	3%	17 lcpm*	22 lcpm
Initial sound identification	66%	10%	10%
Letter sound knowledge	33%	5 lpm	5 lpm
Familiar word reading	43%	7 wpm	12wpm
Invented word decoding	53%	3 wpm	5wpm
Oral reading fluency	43% (Grade 2) 25% (Grade 3)	11 cwpm	16 cwpm
Reading comprehension	81% (Grade 2) 61% (Grade 3)	2%--3+ correct responses 3%--2 correct responses 15%--1 correct response	9%--3+ correct responses 11%--2 correct responses 19%--1 correct response

*“lcpm” = number of letters correctly identified in one minute; “wpm” = number of words read correctly in one minute.

In 2013, the Yemen Early Grade Reading Approach project began. The project conducted impact assessments at the end of Phase I and Phase 2. Table 11 displays the results from the Phase I impact assessment in 2013.

Table 11: Yemen Grade 1 EGRA scores (2013)

EGRA subtasks	Treatment Schools (M)			Control Schools (M)		
	Baseline	Final	% Change	Baseline	Final	% Change
Initial Sound Identification	2.86	5.06	+ 77%	3.22	3.02	- 6%
Letter Sound Knowledge	5.01	18.38	+ 267%	3.43	5.35	+ 56%
Familiar word reading	4.17	9.28	+ 123%	2.60	3.68	+ 42%
Oral Reading Fluency	1.86	7.81	+ 320%	3.68	4.08	+ 32%
Reading Comprehension	1.07	1.57	+ 47%	1.00	1.34	+ 34%
Listening Comprehension	1.45	2.93	+ 102%	1.46	2.58	+ 77%
Writing	2.98	5.79	+ 94%	3.00	4.07	+ 36%

*Blue highlight indicates significant gains by treatment group compared to control group.

Table 11 shows that Grade 1 students improved in almost all the EGRA measures in both the treatment and control groups, however the control group regressed by 6 percent in initial sound identification, although they did show progress on the other tasks. Students in the intervention schools had better scores than students in the control schools across the board. In the treatment group, students showed the most improvement in oral reading fluency with scores increasing from 1.86 to 7.81 correct words per minute (320 percent). The control group had its lowest gains in oral reading fluency (ORF), from 3.68 to 4.08 correct words per minute. However, the control group had higher ORF at baseline. Treatment students showed the least improvement in reading comprehension with scores increasing only 47 percent (from 1.1 to 1.6 correct answers). In the control group, students showed the most improvement in listening comprehension with scores increasing from 1.46 to 2.58 correct answers (77 percent improvement) although the treatment group did better with 102 percent improvement in this category (1.45 to 2.93).

Although there were different groups of pupils tested in Phase 1 between 2011 and 2013 and different grades (in 2011, the EGRA was administered to Grades 2 and 3 students), the 2013 endline treatment group scores exceeded the 2011 Grade 2 pupils' scores in some cases (see Table 12). In letter sound knowledge, for example, the 2013 treatment group of Grade 1 students far exceeded the Grade 2 and Grade 3 students who took the same exam two years earlier (see red text). For word decoding, the 2013 Grade 1 treatment group exceeded the performance of the 2011 Grade 2, although not of Grade 3. The 2013 treatment group remained behind the 2011 group only in ORF. The results suggest that on basic tasks, the 2013 intervention was somewhat effective, although not in reading comprehension, where scores have remained quite low—on par with the 2011 group—even after the treatment.

Table 12: Yemen EGRA endline treatment scores (2011 and 2013)

EGRA subtasks**	Grade 1 (2013)	Grade 2 (2011)	Grade 3 (2011)
Initial sound identification***	5.06	10%	10%
Letter sound knowledge	18.38 lpm	5 lpm	5 lpm
Familiar word reading	9.28 wpm	7 wpm	12 wpm
Oral reading fluency	7.81 cwpm	11 cwpm	16 cwpm
Reading comprehension	1.57	2%--3+ correct responses 3%--2 correct responses 15%--1 correct response	9%--3+ correct responses 11%--2 correct responses 19%--1 correct response

*Red text indicates 2013 treatment group of Grade 1 students who far exceeded the Grade 2 and Grade 3 students who took the same exam two years earlier

**Subtasks are listed as they were worded in 2012 report on 2011 results.

***For initial sound identification, the results from 2011 were not reported as lcpm; correct scores were averaged (not including zero scores); the results suggest that students were able to correctly identify the initial letter sound on average only 10% of the time. The Arabic alphabet has 28 letters so it may also be inferred that average scores were around 2.8 lcpm.

Table 13: Yemen Grade 2 EGRA scores for intervention and control schools (2013)

EGRA Measures	Intervention Schools (M)			Control Schools (M)		
	Baseline	Final	% Change	Baseline	Final	% Change
Initial Sound Identification	3.78	5.98	+ 58%	3.67	3.93	+ 7%
Letter Sound Knowledge	7.30	20.14	+ 176%	7.37	10.71	+ 45%
Familiar word reading	4.67	10.18	+ 118%	5.50	8.29	+ 51%
Oral Reading Fluency	3.82	10.54	+ 176%	3.97	8.95	+ 125%
Reading Comprehension	1.13	1.77	+ 57%	1.09	1.49	+ 37%
Listening Comprehension	1.84	3.45	+ 88%	1.79	3.34	+ 87%
Writing	3.88	8.67	+ 123%	3.99	7.09	+ 78%

*Blue highlight indicates significant gains by treatment group compared to control group.

Table 13 shows that the Grade 2 students improved in all the EGRA measures in both treatment and control groups. The students in the intervention schools had better scores than students in the control schools although in the higher order skills of ORF, reading comprehension and listening comprehension, the differences were not great. In the treatment group, the student showed the most improvement in letter sound knowledge (with scores increasing from 7.30 to 20.14 correct letter sounds per minute (176 percent) and oral reading fluency with scores increasing from 3.82 to 10.54 correct words per minute (176 percent). Likewise, treatment group students made gains in writing. The treatment group students showed least improvement in reading comprehension with scores increasing from 1.13 correct answers to 1.77 correct answers. While the percentage gain looks high, pupils were still not able to correctly answer two out of 5 comprehension questions. In the control group, students showed the most improvement in oral reading fluency with scores increasing from 3.97 to 8.95, while the least improved scores were in initial sound identification, with only a 7 percent score gain from baseline. Unexpectedly, after the intervention in 2013, the oral reading fluency rate of the Grade 2 treatment group (10.54 cwpm) did not exceed that of the 2011 Grade 2 group who took the EGRA.

Table 14: Yemen EGRA baseline scores (Phase 2, 2015)

EGRA Measures	Grade Level	Intervention versus Control Schools			Panel versus Control Schools			Intervention versus Panel Schools		
		Intervention Mean	Control Mean	p value	Panel Mean	Control Mean	p value	Intervention Mean	Panel Mean	p value
Initial Sound Identification	1	0.81	0.62	.94	0.81	0.62	.14	0.81	0.81	.13
	2	2.51	2.31	.81	4.79	2.31	.00*	2.51	4.79	.00*
	Total	1.65	1.46	.82	2.8	1.46	.00*	1.65	2.8	.00
Letter Sound Knowledge	1	0.82	0.81	.07	1.23	0.81	.18	0.82	1.23	0.98
	2	5.18	5.32	.20	18.45	5.32	.00*	5.18	18.45	.00*
	Total	2.99	3.06	.06	9.84	.06	.00*	2.99	9.84	.00*
Familiar Word Reading	1	0.4	0.43	.79	0.31	0.43	.51	0.4	0.31	.49
	2	3.29	3.44	.65	8.1	3.44	.00*	3.29	8.1	.00*
	Total	1.84	1.93	.61	4.2	1.93	.00*	1.84	4.2	.00*
Oral Reading Fluency	1	0.28	0.4	.37	0.21	0.4	.40	0.28	0.21	.49
	2	3.64	4.28	.18	11.56	4.28	.00*	3.64	11.56	.00*
	Total	1.95	2.34	.14	5.88	2.34	.00*	1.95	5.88	.00*
Reading Comprehension	1	0.2	0.03	.27	0.01	0.03	.47	0.2	0.01	.82
	2	0.35	0.46	.09	1.43	0.46	.00*	0.35	1.43	.00*
	Total	0.18	0.25	.06	0.72	0.25	.00*	0.18	0.72	.00*
Listening Comprehension	1	2.41	2.29	.31	2.49	2.29	.25	2.41	2.49	.66
	2	3.3	3.47	.13	3.68	3.47	.22	3.3	3.68	.00*
	Total	2.85	2.88	.70	3.08	2.88	.11	2.85	3.08	.06
Writing Score	1	0.15	0.17	.63	0.11	0.17	.32	0.15	0.11	.32
	2	1.39	1.39	.98	3.06	1.39	.00*	1.39	3.06	.00*
	Total	0.77	0.78	.88	1.59	0.78	.00*	0.77	1.59	.00*

*Blue highlights indicate where the control group exceeded the intervention group and where the panel group exceeded the intervention group within a grade level.

**Red highlights indicate where the panel group greatly exceeded the control group in a grade level.

***Dark gray highlights indicate where the panel group greatly exceeded the intervention group by grade level.

Panel schools are those schools that have received the Yemen Early Grade Reading Approach (YEGRA) for a second year. The intervention schools in this table implemented YEGRA for about 5 months only. From Table 14, the 2015 Yemen baseline shows no significant differences between the mean scores of students in panel schools and other groups in Grade 1. However, there are significant differences between the mean scores panel school students and other groups in Grade 2. This could be because students in Grade 1 were at baseline and the groups were not substantially different yet.

Grade 2 results indicate that prolonged exposure to YEGRA improved the reading skills of students (i.e. those in the Panel Schools). For example, the intervention group and the control group scored similarly in most categories and the control group exceeded the intervention group in some examples. However, the Grade 2 students in the panel school scored substantially higher on a variety of EGRA sub-tasks and many of these differences were statistically significant. The greatest differences were in identifying correct letter sounds per minute (panel: 18.45 correct letter sounds per minute; intervention and control: 5.18 and 5.32 correct letter sounds per minute respectively).

From Table 15, the 2015 Yemen endline shows significant differences in the mean scores of students (Grade 1 and 2) in the intervention schools and control schools for initial sound identification, letter sound knowledge and listening comprehension. For Grade 1, in three cases (initial sound identification, letter sound knowledge, and listening comprehension) these differences are statistically significant at the .00 level (red, bolded rows in Intervention vs. Control columns) and in one case (familiar word reading) at the .02 level. This is a significant change from the Grade 1 baseline performance, where the groups were almost equal. By contrast, for Grade 2 students in the intervention and control schools, there are smaller differences in the mean scores; two (initial sound identification, letter sound knowledge) are statistically significant at the .04 level, but only one (listening comprehension) is significant at the .00 level. There are significant differences in the mean scores (Grade 1 and 2) in panel and control schools for all the EGRA measures. Indeed, all of the differences between the panel and control schools were significant at the .00 level, except for Grade 1 writing, which was significant at the .03 level.

Table 15: Yemen EGRA endline scores (Phase 2, 2015)

EGRA subtasks	Grade Level	Intervention versus Control Schools			Panel versus Control Schools			Intervention versus Panel Schools		
		Intervention Mean	Control Mean	p value	Panel Mean	Control Mean	p value	Intervention Mean	Panel Mean	p value
Initial Sound Identification	1	4.24	3.32	.00*	4.13	3.32	.00*	4.24	4.13	.02*
	2	4.89	4.54	.04*	6.2	4.54	.00*	4.89	6.2	.00*
	Total	4.56	3.93	.00*	5.16	3.93	.00*	4.56	5.16	.00
Letter Sound Knowledge	1	10.07	4.89	.00*	12.75	4.89	.00*	10.07	12.75	0.2*
	2	12.89	10.16	.04*	27.09	10.16	.00*	12.89	27.09	.00*
	Total	11.47	7.52	.00*	19.88	7.52	.00*	11.47	19.88	.00*
Familiar Word Reading	1	4.09	3.27	.02*	5.01	3.27	.00*	4.09	5.01	.10
	2	7.77	7.8	.95	14.34	7.8	.00*	7.77	14.34	.00*
	Total	5.91	5.53	.23	9.64	5.53	.00*	5.91	9.64	.00*
Oral Reading Fluency	1	3.77	3.07	.10	5.13	3.07	.00*	3.77	5.13	.04*
	2	10.29	10.71	.60	18.88	10.71	.00*	10.29	18.88	.00*
	Total	7	6.88	.80	11.96	6.88	.00*	7	11.96	.00*
Reading Comprehension	1	0.42	0.39	.54	0.6	0.39	.01*	0.42	0.6	.03*
	2	1.25	1.22	.78	2.21	1.22	.00*	1.25	2.21	.00*
	Total	0.83	0.8	.63	1.4	0.8	.00*	0.83	1.4	.00*
Listening Comprehension	1	3.17	2.11	.00*	3.12	2.11	.00*	3.17	3.12	.76
	2	3.59	3.13	.00*	4.28	3.13	.00*	3.59	4.28	.00*
	Total	3.38	2.62	.00*	3.69	2.62	.00*	3.38	3.69	.01*
Writing Score	1	0.40	0.40	.98	0.54	0.40	.03*	0.40	0.54	.02*
	2	1.02	1.00	.69	1.59	1.00	.00*	1.02	1.59	.00*
	Total	0.71	0.70	.79	1.06	0.70	.00*	0.71	1.06	.00*

* p<.05

In looking at the endline scores of the panel and the intervention schools, it is clear that the intervention schools' students did not experience as much significant improvement as the students in the panel schools. The gains that were significant at the .00 level all occurred in Grade 2, but some of the Grade 1 differences

were significant as well at .02, .03 or .04. In Grade 2, the intervention schools' students show slight improvement in oral reading fluency scores (10.71 cwpm) in 2015 compared to oral reading fluency (10.54 cwpm) in 2013. The panel schools' students show huge improvement in oral reading fluency scores (18.88 cwpm) compared to the oral reading fluency scores in 2012 (11 cwpm) and 2013 (10.54 cwpm). This further suggests that prolonged exposure (two years) to quality reading instruction had a more positive effect on learning outcomes than exposure for shorter periods (i.e. five months).

While the YEGRA results are impressive and suggest the approach is working in a particularly difficult and conflict-ridden environment, it is important to note that in practice there is still a long way to go; 18.88 words per minute is not fluent reading and students will have to make a great deal more progress to be able to truly read with comprehension. However, the ongoing conflict makes it challenging to provide continuous, stable education to children, never mind much needed teacher professional development and the provision of donor funded assistance projects to the education sector.

Lebanon

Table 16 below presents results from a baseline EGRA conducted in Lebanon in 2016 and an endline conducted in 2018. The sample consisted of both Cohort 1 and Cohort 2 students. Cohort 1 took the baseline in November of 2015 and the Quality Instruction Towards Access and Basic Education Improvement (QITABI) intervention began in January 2016. For Cohort 2, the baseline was administered in April of 2016 and the QITABI intervention began in September of 2016. The endline for both cohorts was administered in April of 2018. Thus, Cohort 1 had an additional five months of exposure to the QITABI interventions than did Cohort 2. Results are presented below.

Table 16 shows that there are positive significant differences between the baseline and endline mean scores of Grade 2 students for phoneme isolation, syllable segmentation, letter sound knowledge, and reading vocabulary. The differences in the endline and baseline scores for letter name recognition and reading comprehension are positive, but not significant. The overall effect sizes show that the intervention has little impact on the reading skills of students. For Grade 2 students, the effect size for the ORF, familiar word reading, and the silent reading comprehension are small and negative (-0.10, -0.5, and -0.05, respectively). Girls show positive effect sizes for phoneme isolation, syllable segmentation, letter sound knowledge, reading comprehension, letter name recognition, familiar word reading and reading vocabulary, but negative effect sizes for ORF and silent reading comprehension. Boys show positive effect sizes in about half of the subtasks, but negative ones for letter name recognition, familiar word reading, ORF, reading comprehension and silent reading comprehension. Overall, the intervention has more impact on girls than boys in Grade 2.

Table 16: Lebanon Grade 2 EGRA baseline (BL) and endline scores (EL) (2018)

	Girls				Boys				All			
	BL	EL	BL-EL Change	Effect size	BL	EL	BL-EL Change	Effect size	BL	EL	BL-EL Change	Effect size
Phoneme isolation	3.2	4.7	1.5*	0.74	2.8	4.3	1.5*	0.75	3.0	4.5	1.5*	0.74
Syllable Segmentation	4.2	5.4	1.2*	0.35	3.8	4.7	0.9*	0.26	4.0	5.0	1.0*	0.30
Letter sound knowledge	9.5	12.9	3.4*	0.23	8.5	9.1	0.5	0.04	9.0	11.0	1.9*	0.13
Letter name recognition	14.2	16.6	2.4*	0.18	12.7	12.5	-0.3	-0.02	13.5	14.5	1.0	0.07
Reading Vocabulary	4.5	6.0	1.5*	0.53	4.2	5.3	1.2*	0.41	4.3	5.6	1.3*	0.47
Familiar word reading	17.8	17.9	0.1	0.01	14.6	13.7	0.8	-0.07	16.2	15.7	-0.5	-0.04
Reading Passage (ORF)	17.1	16.4	-0.6	-0.05	14.3	12.6	-1.8*	-0.13	15.7	14.5	-1.3*	-0.10
Reading Comprehension	1.1	1.2	0.1*	0.13	1.1	1.1	0.0	-0.03	1.1	1.1	0.1	0.05
Silent reading comprehension	2.6	2.6	0.0	-0.03	2.4	2.3	-0.1	-0.06	2.5	2.4	-0.1	-0.05

* $p < .05$

While certain gains were statistically significant, these were mostly in the basic skills of phoneme isolation, syllable segmentation, letter sound knowledge, letter name recognition, and reading vocabulary. Declines are seen in familiar word reading, ORF, and silent reading comprehension overall and some stasis in reading comprehension. Boys declined slightly in all of these skill areas as well as letter name recognition, while girls gained slightly in familiar word reading and reading comprehension, but only slightly. Overall, gains were in foundational skills and while statistically significant in some cases, they did not represent large increases. The same basic trend is seen in the Grade 3 results, in Table 17.

Table 17: Lebanon Grade 3 EGRA baseline and endline scores (2018)

	Girls				Boys				All			
	BL	EL	BL-EL Change	Effect size	BL	EL	BL-EL Change	Effect size	BL	EL	BL-EL Change	Effect size
Syllable Segmentation	5.1	5.5	0.4	0.11	4.8	5.0	0.2	0.07	5.0	5.3	0.3	0.09
Letter sound knowledge	12.5	15.3	2.8*	0.18	11.2	11.0	-0.2	-0.01	11.9	13.1	1.2	0.08
Letter name recognition	20.5	21.2	0.7	0.04	18.6	16.3	-2.3*	-0.15	19.5	18.6	-0.9	-0.06
Reading Vocabulary	5.8	5.9	0.0	0.01	5.4	5.0	-0.4*	-0.12	5.6	5.4	-0.2	-0.06
Familiar word reading	29.7	28.5	-1.2	-0.09	25.7	22.8	-2.9*	-0.19	27.7	25.5	-2.2*	-0.15
Non-word decoding	8.2	8.6	0.3	0.04	6.9	6.0	-0.9*	-0.11	7.5	7.2	-0.3	-0.04
Reading Passage (ORF)	30.3	31.6	1.3	0.08	26.0	24.8	-1.2	-0.07	28.2	28.1	-0.1	-0.01
Reading Comprehension	1.8	1.8	0.0	0.02	1.5	1.5	0.0	0.00	1.6	1.6	0.0	0.00
Silent reading comprehension	2.7	3.2	0.5*	0.33	2.3	2.9	0.5*	0.34	2.5	3.0	0.5*	0.33

* $p < .05$; b= scores at baseline; e= scores at endline; d= effect sizes

Table 17 shows positive, significant differences between the baseline and endline mean scores of Grade 3 students (all) for syllable segmentation, letter sound knowledge, and silent reading comprehension, but the difference is only significant for silent reading comprehension. There are negative differences between the baseline and endline mean scores of Grade 3 students for letter name recognition, reading vocabulary, familiar word reading, non-word decoding and ORF; the differences between the mean scores for the familiar word reading is significant. There was no change at all in reading comprehension scores. Overall, effect sizes were small.

For boys, there are declines in scores and negative effect sizes for all subtasks except for syllable segmentation, and silent reading comprehension. Reading comprehension scores for boys remained the same. Overall, boys experienced more score declines than girls, some of which were statistically significant. They did improve in silent reading comprehension from 2.3 to 2.9, which was as statistically significant gain at the 0.5 level. Grade 3 girls performed better than boys on the QITABI EGRA endline. They experienced a slight decline in familiar word reading but otherwise the girls saw modest gains in all of the tasks and remained static in reading comprehension, as did the boys. The only statistically significant gains were in letter sound knowledge and silent reading comprehension.

Overall, effect sizes for Grade 2 were stronger than for Grade 3 and interestingly, girls in both grades seemed to perform better than boys in general. The girls showed positive effect sizes for all subtasks except for familiar word reading (Grade 3) and ORF and silent reading comprehension (Grade 2). Boys (Grade 3) showed negative effect sizes for all subtasks except for syllable segmentation and silent reading comprehension and remained static in reading comprehension; Grade 2 boys had negative effect sizes in five out of nine EGRA tasks including letter name recognition, familiar word reading, ORF, reading comprehension and silent reading comprehension.

West Bank/Gaza

The first EGRA was administered in West Bank/Gaza in 2014. West Bank/Gaza has traditionally had high literacy rates relative to other countries in the region, which is reflected in its baseline EGRA scores.

Table 18: West Bank/Gaza EGRA baseline scores (2014)

EGRA subtasks	% of Grade 2 students with zero scores	Mean Grade 2 Score	Proposed clpm or cwpm benchmark (Sept 2014)	% of students in March 2014 performing at or above benchmark
Identifying Letter Sounds (lcpm)	6.8%	36.0	45	41%
Reading Familiar Words (cwpm)	10.0%	17.5	N/A	N/A
Decoding Unfamiliar Words	8.7%	13.9	20	50%
Oral Passage Reading with Diacritics (60 seconds, cwpm)	22.1%	16.7	30	10%
Reading Comprehension on Text with Diacritics (out of 6 questions)	35.7%	1.6	50%	30%
Oral Passage Reading without Diacritics (90 seconds, cwpm+30 seconds)	10.9%	24.9	35	27%
Reading Comprehension (out of 6 questions) on Text without Diacritics	25.9%	2.2	50%	50%
Listening Comprehension (out of 6 questions)	7.1%	3.3	N/A	N/A

West Bank/Gaza students displayed strong competence in identifying letter sounds and had a low percentage of students with zero scores. Indeed, 41 percent of students performed at the desired benchmark of 45 clpm. Twenty-nine percent of students met the benchmark for decoding unfamiliar (invented) words, which is an encouraging starting point. Nearly 11 percent of students obtained zero scores for reading an oral passage without diacritical markers (to identify short vowels), while just over 22 percent of students had zero scores when presented with the passage that contained diacritics. Twenty-seven percent of students were able to perform at the benchmark for unvowelized text, while only 10 percent were able to meet the benchmark for reading text with short vowel markers. Most of the literature asserts that short vowel markers facilitate reading in Arabic, since they render the orthography “transparent.” However, recent research (Saiegh-Haddad and Schiff 2016) reports that vowelization “was not found to facilitate reading accuracy in any of the grade levels tested, not even among the youngest second graders (319).” The researchers acknowledge that they used only phonemic diacritics (short vowel markers, not morpho-syntactic markers) and did not use homographs (words in Arabic that are spelled the same and look identical but are pronounced differently); other studies that found different results used both phonemic diacritics as well as morpho-syntactic diacritics and included homographs. Other researchers have referenced the effort and time it takes to “read” the diacritics (Asadi & Khateb, 2017; Elsayyad, Everatt, Mortimore, & Haynes, 2017; Hussien, 2014; Maroun, 2017) and that once students develop morphological awareness, greater syntactical awareness, and a deeper lexicon, they rely principally on these factors to read, rather than phonological processing. Morphological awareness is discussed in more depth below.

In 2018, a second baseline was conducted in the West Bank (Weatherholt, 2018). This baseline examined pre-literacy abilities in kindergarten as well as regular early grade reading tasks, including writing, for Grades 1 and 2. These results are presented in Table 19 below.

Table 19: West Bank/Gaza kindergarten baseline (2018)

Task Category	Percentage of Zero Scores	Mean Score (including zero scores)
Expressive vocabulary	1.2%	10.9%
Letter sounds identification	59.5%	2.2%
Initial sounds	47.3%	2.8%
Listening comprehension	14.0%	3.0%
Recognizing familiar words	31.1%	2.4%
Concepts of print	2.8%	5.2%
Writing: copying letters (3)	7.9%	22.5%
Writing: copying word (house)	20.7%	15.4%
Writing: writing one's name	32.8%	15.9%

Within these results, there were some interesting gender disparities. More boys than girls had zero scores in recognizing familiar words (35.6 percent of boys had zero scores vs 26.4 percent of girls) and the difference was statistically significant. Mean scores showed no statistically significant differences on the first six task categories. However, boys also had significantly higher percentages of zero scores in all of the writing tasks for the kindergarten assessment and girls' mean scores were higher than boys' at a statistically significant level. For this latter difference, the report speculates that differences could have to do with fine motor skill developmental differences between boys and girls at this age (p. 17). For Grades 1 and 2, two groups were tested—an EGR treatment group and a comparison group. Since this was a baseline (pre-treatment), there were no significant differences between the two groups in either grade. Results are presented in Table 20 below.

Table 20: West Bank/Gaza Grades 1 & 2 EGRA baseline scores (2018)

	% of Zero Scores		Mean Scores		% of Zero Scores		Mean Scores	
	Grade 1 Treatment	Grade 1 Comparison	Grade 1 Treatment	Grade 1 Comparison	Grade 2 Treatment	Grade 2 Comparison	Grade 2 Treatment	Grade 2 Comparison
Listening comprehension	9.7	10.4	58.1	59.8	5.3	6.1	69.8	73.9
Letter sounds	5.5	3.7	32.1	33.3	3.8	2.6	42.9	44.6
Familiar words	9.5	4.9	9.4	9.3	5.6	1.8	16.2	17.3
Invented words	8.2	4.2	8.9	9.1	3.8	1.3	12.5	13
ORF	16.3	9.9	9.7	9.3	8.2	4.3	22.4	24.4
Reading comprehension	63.3	60.4	18.1	20.9	32.0	25.5	45	50.8
Copying letters	1.1	1.1	17.4	21.3	.3	0	24.6	25.1
Write the word "school"	11.7	9.1	13.3	16.2	6.9	5.4	18.0	22.5
Write the sentence, "What do you do every morning?"	19.9	16.4	.1	1.9	9.4	7.2	3.6	2.3
Write an answer to the question, "What do you do every morning?"	24.2	24.8	3.9	3.1	12.8	9.5	14.3	12.7

Overall, while the baseline report states that “students are following the developmental progression of reading ability” (p. 3) and that students in both groups are making notable progress from Grade 1 to Grade 2. However, scores could be stronger in Grade 1 for some of the basic skills such as recognizing familiar words and decoding invented words, as well as ORF. These improve by Grade 2 but, for example, the mean score for writing the word “school” is still quite low, as are the tasks for writing and then answering a sentence. In addition, although ORF has improved significantly between the grades, it is still low in Grade 2. It is also important to note that a comparison of zero scores between 2014 and 2018 shows that there was a reduction in the four-year period between the baselines, which is also encouraging. Finally, it is also worth noting that the measurement of writing skills is informative in that it strongly demonstrates that writing needs more attention.

EGR RESULTS: COUNTRIES WITH A SINGLE EGRA ADMINISTRATION OR MULTIPLE ASSESSMENTS USING DIFFERENT INSTRUMENTS

This section summarizes data from countries that have only administered one round of EGRA or a similar early grade reading assessment. Baseline measures are reported below in Table 21, Table 22, and Table 24.

Iraq

These results indicate that students generally made progress from Grade 2 to 3, but not enough to become fluent readers. Of note, ORF scores almost doubled from Grade 2 to 3. In listening comprehension, pupils were able to answer more than half of the questions correctly by Grade 3. There were no subsequent EGRA administrations in Iraq.

Table 21: Iraq Grades 2 and 3 EGRA scores (2012)

Subtasks	Grade 2	Grade 3
Letter sound knowledge (100 letters presented; pupils had 1 minute of time to make letter sound)	13.6	13.5
Nonword decoding (out of 50 pronounceable made-up words/1 minute of time)	3.7	4.7
Oral reading fluency (50-word story to read aloud/1 minute of time)	11.4	21.2
Reading comprehension (6 questions about the story—basic facts)	0.9	1.6
Listening comprehension (passage read to pupils; 6 questions about passage)	2.9	3.4

Syria

Data on Syrian students’ reading and math performance from robust studies are lacking, however, two small studies found the following results, presented in Table 22 and Table 24, which constitute “emerging” evidence in terms of rigor.

A baseline study on preschool children receiving remedial education and psychosocial services was carried out in the Raqqa region of Syria in 2018 (Sinclair, 2018). The study used the International Development and Early Learning Assessment (IDELA) tool, which examines four domains of development: motor development, emergent literacy, emergent numeracy and socio-emotional development. The sample was small—16 children tested across only two preschool centers—and there was wide variability in the scores in each domain. Hence, this study is not rigorous, but rather “emerging” in terms of rigor; nonetheless the report data there fills a gap in information on reading (and math) levels in Syria. Table 22 displays the emergent literacy skill scores.

Table 22: Emergent literacy skills of Syrian pre-school children in Raqqa

IDELA Domain: Emergent Literacy Subtasks	% of answers correct
Oral vocabulary	52.2%
Print awareness	58.3%
Letter identification	34.7%
Emergent writing	45.3%
Oral comprehension	62.5%
Initial sound discrimination	52.1%
Total average emergent literacy score	50.8%

Children received an overall mean score of 51 percent correct replies when tested for emergent literacy. Children scored highest in oral comprehension and print awareness, and lowest in letter identification and emergent writing. These scores suggest that the tested children’s preschool programs did have some positive impact on preparing them for school, assuming other variables were constant.

A second Syrian study conducted by the International Rescue Committee (IRC) used the Annual State of Education (ASER) tool to assess literacy and numeracy performance in two schools and tested 122 students (96 boys and 26 girls) in December 2015. IRC undertook a larger ASER assessment across five schools in the Idleb governorate in November 2016. The sample included 2846 children (1255 boys and 1591 girls), including some internally displaced children and some who were part of the “host” communities in Idleb. Both assessments focused on Grades 1–8. ASER uses the following scale for assessing reading:

Table 23: ASER Scale for Reading

ASER Score	Explanation
0 = Nothing	The child cannot identify 4 out of 5 letters presented
1 = Letter	The child can correctly identify 4 out of 5 letters presented
2 = Word	The child can correctly identify 4 out of 5 words presented
3 = Paragraph	The child can read a short 4-sentence paragraph of approximately 19 words
4 = Story	The child can read a 7 – 10 sentence story of approximately 60 words.

The ASER scale tests for Grade 2 level reading skills, so children above Grade 2 should, in theory, score at the 4 level. However, this was not the case with the Syrian children tested in 2016. The assessment report states that: “59 percent of 6th graders, 52 percent of 7th graders and 35 percent of 8th graders could not read a story—the equivalent of a 2nd grade level of reading (IRC, March 2017, p. 4).” Although evidence is sparse, results seem to indicate that children in war-impacted regions of Syria are not developing foundational skills in reading. This could be due to missed and/or interrupted schooling because of conflict (lack of safety to go to school, destroyed schools, missing teachers, targeting schools, etc.) and the need to flee one’s home or community.

Table 24: Percent of children unable to read at Grade 2 level, Idleb Governorate²²

Grade	Male	Female	All
Grade 2	98%	95%	96%
Grade 3	89%	82%	86%
Grade 4	76%	72%	74%
Grade 5	68%	52%	60%
Grade 6	52%	65%	59%
Grade 7	72%	40%	52%
Grade 8	58%	25%	35%

RESULTS FROM INTERNATIONAL READING ASSESSMENTS

PIRLS READING RESULTS

In addition to country-specific EGRAs, some MENA countries have participated in international assessments. This section reports reading data from MENA countries from the Progress in International Reading Literacy Study (PIRLS), a measure of reading skills in Grade 4. Countries can choose to participate in this study, which is administered by the International Association for the Evaluation of Educational Achievement every five years. Table 25 reports these by test and country.

²² The way in which these data were reported is not entirely clear and detailed. Table 24 represents an aggregate of the ASER data that IRC collected and reported. Although the IRC report does contain some specific score information vis à vis the ASER scale, no tables were presented using the actual ASER scale. IRC reported data as “% of students unable to read at 2nd grade level” without explaining how they came to the percentages reported. It is assumed that all students who could not complete the story task above in Table 24 were deemed to be not reading at a Grade 2 level; this figure would include all those students who failed at the earlier tasks as well. In addition, in reporting these data IRC used a bar chart and only provided the exact percentage for “All” pupils, not the exact percentage for male and female students; hence the % here for male and female students could be slightly off.

Table 25: PIRLS results for Grade 4 students in MENA countries (2015) ²³

Country	Boys			Girls			Overall	
	2011	2015	Change	2011	2015	Change	2015	Change
Bahrain	-	424	-	-	468	-	446	-
Egypt	-	312	-	-	349	-	330	-
Kuwait	-	376	-	-	410	-	393	-
Morocco	296	344	+48	326	372	+46	358	+40
Oman	371	395	+24	411	442	+31	418	+27
Qatar	411	424	+13	441	460	+19	442	+17
Saudi Arabia	402	399	-3	456	464	+8	430	None
United Arab Emirates	425	436	+11	452	465	+13	450	+11
International Average	-	501	-	-	520	-	500	-

Overall, Arabic speaking countries that participate in PIRLS are doing well and steadily making gains, some of which are very impressive, like Morocco and Oman. Girls consistently scored higher than boys on the PIRLS in 2015 in all the participating Arabic speaking countries. Girls also made greater gains in their scores from 2011 to 2015, except in Morocco where boys made slightly higher gains than girls from 2011 to 2015.

PISA READING RESULTS

The Programme for International Student Assessment (PISA) is another international comparative study administered by the Organisation for Economic Co-operation and Development (OECD) in member and non-member nations. The purpose of PISA is to assess educational systems through testing 15-year-old school pupils' performance in reading, mathematics, and science. The test is repeated every three years. While PISA does not measure early grade reading, it provides a sense of whether students are learning foundational skills in reading and math well in the early grades. The scores below in Table 26 report the reading levels of 15-year-old students for 2012 and 2015. Reading scores in Qatar and Jordan improved by 14 and 9 points respectively between 2012 and 2015. The improvement is statistically significant in Qatar, though it is not statistically significant in Jordan. Conversely, the reading scores in the UAE and Tunisia declined. The decline is statistically significant in Tunisia, though it is not statistically significant in the UAE.

²³ The PIRLS 2011 report did not include data for Bahrain, Egypt and Kuwait; so, it is assumed that these countries did not participate in the 2011 administration.

Table 26: PISA results in reading for students in MENA countries (2015)

Country	Mean PISA score		Difference in mean scores (2012-2015)	Average PISA trend that is statistically significant
	2012	2015		
United Arab Emirates	442	434	-	-8
Tunisia	404	361	-21*	-43
Jordan	399	408	-	+9
Qatar	388	402	15*	+14
Lebanon	No information	347	-	-
Algeria	No information	350	-	-

* $p < 0.05$.

Source: OECD, PISA 2012 and 2015 Database

Note: PISA 2015 mean performance across the 35 OECD countries is 493, with an average standard deviation of 96 points.

The fact that 15-year old students in these countries are scoring below the international average of 500 on the reading portion of the test is troubling for several reasons. First, by age 15, students should be proficient readers. Scores that are lower than the international average do not bode well for future academic success and could be a hindrance for graduates trying to find good employment. Second, these scores suggest that children are not mastering foundational reading skills in the early grades. When children fall behind in reading in early grades, they rarely catch up. This is known as the *Matthew effects*. Wahlberg and Tsai (1983) identified the *Matthew effects* and the concept was further developed and explored by Stanovich (1986). The *Matthew effects* are not only about the progressive decline of slow starters, but also about the widening gap between slow starters and fast starters. Children at a low initial performance level in reading tend to remain at a relatively lower level than their peers. Moreover, their rate of development is slower than the rate of development of children with high initial performance levels in reading. The ensuing performance divergence as children with poorer skills fall increasingly behind poses significant challenges for educators and educational systems (Protopapas, 2016). Juel, cited in Cain and Oakhill (Cain, 2011), further demonstrated that good readers make greater gains in measures of writing composition and listening comprehension than poorer readers between Grades 1 and 4. Harlaar, Dale, and Plomin (2007) and Mol and Bus (2011) also reported findings that corroborate the *Matthew effects* framework. For these reasons, it is critical that children master foundational reading skills in early grades.

EGMA RESULTS

Only Jordan has administered the EGMA twice. Other countries have only one administration. Hence, this section presents the EGMA results by country, organized alphabetically.

Egypt

Egypt experienced a similar pattern of performance in Grades 2 and 3 in its EGMA in 2015. Student scores were higher on the easier Level 1 addition and subtraction tasks and lower on the more difficult subtasks. Students in Grades 2 and 3 were able to rapidly identify numbers and the percentage of zero scores for this subtask was low. Almost 20 percent of Grade 2 students received zero scores on the Level 1 addition tasks such as adding two single digit numbers; Over 40 percent for Grade 2 students and almost 30 percent for Grade 3 students scored zero on the Level 1 subtraction tasks. Further, the EGMA report states that, “in both grades, students could correctly add 64 percent and 73 percent of the Level 1 items attempted, but did so slowly, completing less than 10 sums per minute—indicating that for students in both grades this skill has yet to become fully automatic” (DeStefano, 2016, p. 3). As indicated, students’ performance in subtraction was worse.

Table 27: Egypt EGMA results (2015)

EGMA subtasks	Grade 2		Grade 3	
	% scoring zero	Avg. items correct/minute	% scoring zero	Avg. items correct/minute
Number Identification	4%	15.1	1%	21.4
Addition Level 1	18%	6.8	13%	9.2
Subtraction Level 1	41%	4.0	29%	5.6
EGMA subtasks	Grade 2		Grade 3	
	% scoring zero	Avg. percent correct of out of items attempted	% scoring zero	Avg. percent correct out of items attempted
Quantity Discrimination	10%	44%	6%	56%
Missing Number	15%	35%	9%	44%
Addition Level 2	36%	22%	22%	34%
Subtraction Level 2	42%	48%	38%	17%
Word Problems	20%	32%	10%	43%

Overall, students did well in identifying larger and smaller numbers in relation to each other but, “in both grades, students were not very accurate in their responses, answering only 44 percent of items correctly in Grade 2 and 56 percent in Grade 3 (DeStefano, 2016, p. 3). This pattern was similar in the identifying missing numbers in a sequence subtask. Performance was much lower for more difficult Level 2 addition and subtraction problems, especially compared with the Level 1 subtask and especially in Grade 2. Subtraction scores for both levels were poor, indicating this is an area of difficulty for Egyptian students. Interestingly, the word problem subtask had a lower percentage of zero scores than the Level 2 addition and subtraction tasks. Still, performance on the word problems at Grade 2 level was not high, although some progress is reflected in Grade 3 performance.

For the most part, girls and boys in Grades 2 and 3 performed equally across all the mathematics subtasks. The one exception was Level 2 addition, where girls out-performed boys in both grades, but only by a few points. Further, Egypt’s EGMA results indicated that students did poorly on subtraction involving two-digit numbers and had difficulty with conceptual tasks like evaluating relative quantity, identifying patterns, and applying basic operations to solve word problems. They were able to solve simple word problems, compare quantities, and demonstrate an understanding of number patterns but only at very basic levels; once the difficulty level increased, performance dropped precipitously (DeStefano, 2016).

Jordan

In Jordan, the treatment group performed better than the control group in 2012 and 2014 as shown in Table 28. Hence, the treatment group was at a higher starting point in all tasks except word problems in 2012. Likewise, in 2014, both groups made gains across all subtasks. The treatment group’s gains were significantly larger than the control group’s gains across all subtasks, but the gains in more difficult tasks of Level 2 addition and subtraction and word problems were impressive. These data suggest that the intervention had a substantial, positive impact on treatment group performance.

Table 28: Jordan EGMA subtasks: percentage correct by year and control/treatment status

EGMA subtasks	Control			Treatment		
	2012	2014	Change	2012	2014	Change
Number identification	78.4%	84.6%	6.2%	82.4%	92.6%	10.2%
Quantity comparison	69.9%	78.9%	9.0%	72.9%	89.4%	16.5%
Missing number	49.0%	58.3%	9.3%	54.2%	72.3%	18.1%
Addition and Subtraction L1	31.3%	52.8%	21.5%	34.9%	63.1%	28.2%
Addition and Subtraction L2	39.2%	43.5%	4.3%	39.9%	59.8%	19.9%
Word problem	40.6%	57.6%	17.0%	38.7%	68.7%	30.0%

Girls outperformed boys on all tasks in EGMA, as visible in Table 29. The differences between the boys and the girls are statistically significant on three of the six EGMA. The school type appears to be a predictor of success, with students in all-girls schools performing better than boys in all-boys schools and students in mixed schools. The fact that girls seem to be doing better in math on the EGMA assessment is consistent with the Trends in International Mathematics and Science Study (TIMSS) results for Jordan as well (see section below on PISA and TIMSS).

Table 29: Jordan EGMA scores, by student gender and school type

EGMA (treatment scores)	Student (mean score)		School Type (mean score)		
	Male	Female	Boys	Girls	Mixed
Number identification	90.9%	93.9%*	80.0%	94.9%**	93.1%
Quantity comparison	87.8%	90.6%	84.1%	93.5%**	89.3%
Missing number	71.4%	73.1%	66.2%	75.3%	72.9%
Addition/subtraction L1	61.1%	64.7%* [†]	57.9%	67.5%**	63.0%
Addition/subtraction L2	54.1%	64.3%**	51.0%	70.4%***	58.4%
Word problems	66.6%	70.3%	63.4%	74.5%*	68.0%

* $p < 0.10$, ** $p < 0.01$, *** $p < 0.0001$

Another way to interpret the findings, which seem to be quite positive, is to look at the zero scores (i.e. the percentage of pupils who answered zero questions in a subtask correctly) that are included in Table 30 below.

Table 30: Jordan EGMA subtasks: zero scores by year and control/treatment status

EGMA subtasks	Control			Treatment		
	2012	2014	Decrease in zero scores	2012	2014	Decrease in zero scores
Number identification	1.2%	0.3%	75%	0.0%	0.0%	0.0%
Quantity comparison	3.8%	2.0%	47.37%	2.1%	10.0%	95.2%
Missing Number	5.1%	3.1%	39.2%	2.4%	40.0%	83.3%
L1 Addition and Subtraction	9.7%	2.3%	76.3%	4.4%	40.0%	90.9%
L2 Addition and Subtraction	7.0%	13.4%	+85.8%	5.4%	5.4%	0.0%
Word problem	32.3%	7.3%	77.4%	31.1%	3.0%	90.4%

Notes: Blue highlights indicate static or increasing zero scores. Red highlights indicate substantial (over 75%) decreases in zero score responses between 2012 and 2014.

Table 30 shows that except for the word problem subtask, the control group had a higher percentage of zero scores in all the other subtasks than the treatment group. By 2014, the percentage of zero scores across all subtasks for both groups went down, except for the Level 2 addition and subtraction task. The percentage decrease in zero scores between 2012 and 2014 was substantial for both groups, but much higher for the treatment group. The percentage of zero scores rose by almost 86 percent for the control group in 2014 and stayed static for the treatment group (see blue highlighted cells above). It could be that the Level 2 subtask skills are not covered as extensively in the curriculum for children at this stage, which is why there was no movement in the scores in the treatment group; however, this would not explain the rise in zero scores in the control group. It could also be related to how well the Level 2 skills are taught in schools.

Morocco

Table 31: Morocco EGMA results (2012)

EGMA subtasks	Grade 2		Grade 3	
	# correct/minute	% correct of attempted	# correct/minute	% correct of attempted
Number Identification	22.2	71.2%	34.2	87.7%
Quantity discrimination	11.8	69.6%	17.9	85.1%
Missing number	5.7	47.3%	8.3	62.9%
Addition	7.3	56.2%	11.0	74.0%
Subtraction	5.1	33.3%	7.0	54.7%

Note: Values that are statistically significant are marked in bold; $P < 0.05$.

Source: OECD, PISA 2012 and 2015 Database

Table 31 above shows the average number of items correct per minute achieved by Moroccan pupils in Grades 2 and 3 as well as the average percentage correct out of items attempted for each subtask. For Grade 2, the average percentage of items correct per the number of items attempted demonstrate reasonable achievement for the first two subtask areas, which are considered easier. The missing numbers and addition subtasks both have mediocre average percentages of correct items per number attempted, but subtraction is the where Grade 2 students had the most difficulty. As expected, the Grade 3 students were stronger in all the task areas, including subtraction, although the average percentage correct per number of items attempted was only about 55 percent.

Syria

A baseline study on preschool children receiving remedial education and psychosocial services was carried out in the Raqqa region of Syria in 2018 (Sinclair, 2018). The study used the IDELA tool, which examines four domains of development: motor development, emergent literacy, emergent numeracy and socio-emotional development. The sample was small—16 children tested across only two pre-school centers—and there was wide variability in the scores in each domain. This study is “emerging” in terms of overall rigor and fills a gap in terms of studies on reading and math performance in Syria at present. Below are the emergent numeracy skill scores.

Table 32: Emergent numeracy skills of Syrian pre-school children in Raqqa

IDELA Domain: Emergent Literacy Subtasks	% of answers correct
Comparison by size and length	90.6%
Shape identification	62.5%
Sorting and classification	75.0%
Number identification	20.6%
One to one correspondence	50.0%
Addition and subtraction	60.4%
Puzzle completion	44.8%
Total average emergent literacy score	57.7%

Children received an overall mean score of about 58 percent correct replies when tested for emergent numeracy. Children scored highest in comparison by size and length and shape identification, and lowest in number identification and puzzle completion. Students identified only 4 out of 20 numbers presented to them, on average. They clearly understood number concepts but may have not been exposed to written numbers, perhaps due to lack of classroom resources like paper and pencils, blackboards, etc. These scores suggest that the tested children’s preschool programs had a positive impact on preparing preschoolers for school, assuming other variables were constant, although the sample is too small to generalize.

The IRC conducted a second Syrian study and used the ASER tool to assess literacy and numeracy performance in in two schools, with 122 students (96 boys and 26 girls) in December of 2015. IRC undertook a larger ASER assessment across five schools in the Idleb governorate in November of 2016. The sample included 2846 children (1255 boys and 1591 girls), some internally displaced and some who were part of the “host” communities in Idleb. Both assessments focused on Grades 1 through 8. ASER uses the following scale for assessing mathematics:

Table 33: ASER Scale for Mathematics

ASER Score	Explanation
0 = Nothing	The child cannot identify 4 of 5 randomly selected numbers from 1–9.
1 = Number Recognition (1–9)	The child can correctly identify 4 out of 5 randomly selected numbers from 1–9.
2 = Number Recognition (11–99)	The child can correctly identify 4 out of 5 randomly selected numbers from 11–99.
3 = Addition	The child can correctly solve 2 problems
4 = Subtraction	The child can solve 1 problem

As with reading, students beyond Grade 2 should score at least at the 4 level (as the ASER scale tests for Grade 2 mathematics skills). However, the assessment report states that: “64 percent of 6th graders, 63 percent of 7th graders and 46 percent of 8th graders could not solve a subtraction problem—the equivalent of 2nd grade math skills (IRC, March 2017, p. 4).” As with reading, these results indicate that children in war-impacted regions of Syria are not developing foundational skills in mathematics. This could be due to

missed or interrupted schooling due to effects of conflict, such as lack of safety going school, destroyed schools, missing teachers, targeting schools, and the need to flee one's home or community.

Table 34: Percent of children unable to do Grade 2 math, Idlib Governorate, Syria

Grade	Male	Female	All
Grade 2	92%	96%	98%
Grade 3	75%	85%	85%
Grade 4	62%	71%	74%
Grade 5	62%	65%	72%
Grade 6	72%	64%	52%
Grade 7	59%	63%	80%
Grade 8	41%	46%	64%

RESULTS FROM INTERNATIONAL MATH ASSESSMENTS

As noted above, PISA measures science, mathematics, and reading scores at the age of 15 every three years in participating countries. While PISA does not measure early grade mathematics achievement, it provides a sense of whether foundational skills in mathematics are learned well in the early grades. Six Arabic-speaking countries participated in the PISA test in 2015.

PISA Math Results: Table 35 shows that Qatar and Tunisia's 2015 PISA mathematics scores improved with a difference of 26 and 4 respectively between 2012 and 2015. These improvements are statistically significant.

Table 35: 2012 and 2015 PISA mathematics results in MENA Countries

Country	PISA Mean Score		Score difference (2012 to 2015)	Average PISA trend that is statistically significant
	2012	2015		
United Arab Emirates	434	427	-7	-
Tunisia	388	367	-21	4*
Jordan	386	380	-6	-
Qatar	376	402	+26	26*
Lebanon	No information	396	-	-
Algeria	No information	360	-	-

Note: Although Tunisia saw a drop in average score, its overall trajectory across PISA assessments in mathematics is positive (+3.8 points every three years) and statistically significant (OECD, 2016, p. 182). Only Qatar's progress in mathematics has been consistent and statistically significant in the MENA region.

The PISA reports from 2012 and 2015 indicate that on average, boys outperform girls in mathematics. The 2015 report states that boys' advantage at the mean is statistically significant in 28 countries and economies, and is largest in Austria, Brazil, Argentina, Chile, Costa Rica, Germany, Ireland, Italy, Lebanon, and Spain, where boys' average scores exceeds girls' by more than 15 points. It is noteworthy that none of the high-performing Asian countries and economies is among this group. In fact, in nine countries and economies, including top performers Finland and Macao (China), as well as Albania, the Former Yugoslav Republic of Macedonia, Georgia, Jordan, Malaysia, Qatar and Trinidad and Tobago, girls score higher than boys in mathematics, on average (OECD, 2016, p. 196). It is interesting to note that only in Lebanon are boys' average scores higher than girls by 15+ points. In Jordan and Qatar, girls' average scores on PISA are higher than boys' scores on average.

TIMSS MATH RESULTS

The Trends in International Mathematics and Science Study (TIMSS) monitors achievement in mathematics and science in Grades 4 and 8 in participating countries. Like the PIRLS, TIMSS is administered by the International Association for the Evaluation of Educational Achievement's PIRLS and TIMSS International Study Center, housed at Boston College's Lynch School of Education's International Study Center. In 2015, eight Arabic-speaking countries participated in the TIMSS.

Table 36 shows that the UAE had the highest average scale score of 452 in Grade 4 and 465 in Grade 8. Kuwait had the lowest average scale score of 352 in Grade 4, while Saudi Arabia had the lowest average scale score of 368 in Grade 8. These results are interesting in that all the Arabic speaking countries which took the TIMSS test in 2015 scored below the average score set at 500. While some high-income countries like Bahrain, Oman, and Qatar scored above 400, other high-income countries scored in the same range as the two middle- to low-income countries, Jordan and Morocco. Indeed, Kuwait and Saudi Arabia scored below Morocco and Jordan in terms of Grade 4 mathematics skills. Grade 8 results followed the same pattern and Moroccan students did substantially better on the Grade 8 TIMSS than the Grade 4 assessment. These results suggest that resources are not entirely correlated to scores. Even extremely well-equipped schools and affluent populations, such as those in the Gulf countries, are not performing at a satisfactory level and in some cases, countries where schools and the general population do not have access to the latest resources outperformed those with high access to resources.

Table 36: Arabic-speaking countries TIMSS math achievement, Grades 4 and 8 (2011 & 2015)

Country	Average scale scores			
	Grade 4		Grade 8	
	2011	2015	2011	2015
Bahrain	436	451	409	454
Jordan	-	388	406	386
Kuwait	342	352	-	392
Morocco	335	377	371	484
Oman	385	425	-	403
Qatar	413	439	410	437
Saudi Arabia	410	376	394	368
United Arab Emirates	434	452	456	465
West Bank/Gaza	-	-	404	-
Tunisia	359	-	425	-
Lebanon	-	-	449	-
Yemen	248	-	-	-
Syria	-	-	380	-

Note: Not all countries take all of the TIMSS test each year it is offered; there are no scores available for Jordan, Grade 4 in 2011, Kuwait, Grade 8, 2011, and Oman Grade 8, 2011. Several countries in the MENA region took the TIMSS in 2011 for either Grade 4 or 8, or both. Those average scores are included here for general reference.

Source: Trends in International Mathematics and Science Study (National Center for Education Statistics), 2015 and 2011

In Arabic-speaking countries that participated in the TIMSS, girls' scores both in Grades 4 and 8 substantially exceeded boys' scores, from +1 to +43 in Grade 4 and from +2 to +32 in Grade 8.

Table 37: Arabic-speaking countries TIMSS math achievement, by gender, Grades 4 and 8 (2015)

Country	Grade 4			Grade 8		
	Girls' Avg. Score	Boys' Avg. Score	Difference between girls' and boys' average scores (favoring girls)	Girls' Avg. Score	Boys' Avg. Score	Difference between girls' and boys' average scores (favoring girls)
Bahrain	459	443	15	462	446	16
Jordan	399	379	20	395	376	19
Kuwait	359	347	12	396	389	7
Morocco	378	377	1	385	384	2
Oman	436	415	22	420	388	32
Qatar	440	438	3	440	434	7
Saudi Arabia	405	363	43	375	360	14
United Arab Emirates	453	450	3	471	459	12

Source: Trends in International Mathematics and Science Study (National Center for Education Statistics), 2015

Table 37 shows that girls' performance was better than boys' in all participating Arabic-speaking countries in both Grades 4 and 8. In Grade 4, girls in Saudi Arabia had much higher score (+43) than boys. In Morocco, girls only had a slightly higher score (+1) than the boys. In Grade 8, the trends seem to continue. In Oman, girls had much higher scores (+32) than the boys in Grade 8, while girls in Morocco again only just edged out boys (+2). In Morocco and Qatar, the differences between the boys and girls in both grades were quite small. In the UAE, the difference was low in Grade 4 but greater in Grade 8, suggesting the boys began to fall behind. In Kuwait, boys began to close the gap by Grade 8, where on average they scored 7 points behind girls.

As with the reading scores, these TIMSS results in mathematics suggest that the problem is not one of resources in higher versus lower income countries, but probably has more to do with curriculum and teaching. Finally, Table 38 below shows the overall trend of mathematics learning is mixed. The table compares the 2011 TIMSS results with the 2015 TIMSS results by grade and gender.

Table 38: Mathematics achievement in Arabic-speaking countries in Grade 4 and 8, by gender (2011 and 2015)

Country	Grade 4						Grade 8					
	Girls			Boys			Girls			Boys		
	2011	2015	Change (2011-2015)	2011	2015	Change (2011-2015)	2011	2015	Change (2011-2015)	2011	2015	Change (2011-2015)
Bahrain	440	459	+19	432	440	+11	431	462	+31	388	446	+58
Jordan	-	399	-	-	379	-	420	395	-25	392	376	-16
Kuwait*	358	333	-25	323	320	-3	-	396		-	389	-
Morocco	338	378	+40	331	377	+46	371	385	+14	371	384	+13
Oman	398	372	+38	372	415	+43	397	420	+23	334	388	+54
Qatar	420	440	+20	407	438	+31	415	440	+25	404	434	+30
Saudi Arabia	418	405	-13	402	363	-39	401	375	-26	387	360	-27
Unites Arab Emirates	438	453	+15	430	450	+20	464	471	+7	447	459	+12

*Trend results do not include private schools, no available data for 2011

Source: Trends in International Mathematics and Science study (National Center for Education Statistics) by Gender, 2015

Table 38 shows that the scores for both boys and girls improved between 2011 and 2015. Boys' scores tended to be lower than girls' scores in most of the countries— Bahrain, Morocco, Oman, Qatar and the UAE; however, boys had much higher scores than girls in Qatar. In Saudi Arabia, the scores for both boys and girls in Grades 4 and 8 did not improve and boys showed lower performances than girls. Overall, boys made more improvements between 2011 and 2015 than girls did in Grade 4.

SYNTHESIS OF RQ2 FINDINGS

Research Question 2 (RQ2): What is the current level of EGR and EGM performance in Arabic-speaking MENA countries according to targets (boys, girls, students in or out of school, marginalized, etc.)?

While absolute scores are still low, MENA countries have made enormous progress in both EGR and EGM basic skills such as letter sound identification, simple word reading, number identification, quantity discrimination, simple addition and subtraction. However, higher order skills such as oral reading fluency, reading and listening comprehension, number pattern identification, more complex addition and subtraction operations, and word problems have not progressed to the same degree. Scores from other international tests, such as PIRLS, PISA and TIMSS demonstrate these trends across both subjects.

WHERE HAS THE MOST AND LEAST EGR AND EGM PROGRESS BEEN MADE?

Most Progress

Reading: Much progress in early grade reading has occurred at the level of phonemic and syllabic awareness; there has been some progress in decoding as well (nonfamiliar word reading). For example, in 2009, Grade 2 treatment group students in Egypt named 6.76 correct letters per minute (clpm); control group students named 8.55 clpm. In 2011, the treatment group improved to 47.28 clpm, whereas the control group was only able to name 10.10 clpm. Decoding unfamiliar word scores also increased consistently. The Girls' Improved Learning Outcomes (GILO) project in Egypt was one of the first to focus on early grade reading skills and the project strongly emphasized foundational skills such as recognizing

letters, their sounds, and decoding. Subsequent projects, along with MOE initiatives, built on these approaches. In a separate EGRA test with different students, the average was 18.8 clpm in 2013. In 2014, it rose to 27.7 clpm and in a third, larger EGRA in 2015 with another group of pupils, Grade 2 students averaged 18 clpm and Grade 3 students averaged 22.5 clpm. This is consistent progress since the 2009 treatment and control cohorts did not exceed 10 letters in one minute's time. Likewise, Jordanian, Lebanese, Palestinian and Moroccan Grade 2 students showed significant gains in phonemic awareness and syllable identification. These are foundational skills, and this is important progress.

Mathematics: While EGM projects are newer in the region and thus have a shorter track record than EGR projects, there is no progress over the last five years, based on both EGMA and international tests such as PISA and TIMSS. Jordan and Qatar have shown the most progress in mathematics achievement, albeit using different measures. For example, Jordan has shown progress on the EGMA from 2012 – 2014: students in the treatment group substantially reduced zero scores on tasks such as quantity comparison, identifying missing numbers/seeing patterns in number sequences, Level 1 basic addition and subtraction, and solving word problems. Moreover, students in the EGM treatment group also made substantial gains between pre- and post-tests in all EGMA subtask areas.

Likewise, Qatar gained a statistically significant 26 points on the PISA math assessment between 2012 and 2015 and has also seen steady, upward gains for Grade 4 and Grade 8 students on the TIMSS (Mullis, 2016; OECD, 2016, 2018). Bahrain and UAE made solid progress on the TIMSS math test as well from 2012 – 2015.

Marginalized Children

There are few specific reports with data indicating if marginalized children have made progress in EGR or EGM and the few that exist report on very small studies. Still there are some positive trends to note.

Literacy and numeracy outcomes for conflict-affected children in the region: The issue of providing access to quality education for children in conflict and crisis contexts has received growing attention and this is a positive development. Steps to get educational resources to children in these contexts have accelerated. The All Children Reading Grand Challenge, funded by USAID, World Vision, and Australia Aid, spurred some innovative online programs combining a focus on reading and psychosocial well-being, such as “Feed the Monster” or “Antura and the Letters,” which are resources that can be made available to children displaced by war and violence.²⁴ Likewise the site War Child (<https://www.warchildholland.org/projects/cant-wait-to-learn/>), supported by a variety of donors, including USAID which co-funded the games for Jordan and Lebanon, offers a “Can’t Wait to Learn” set of ICT-assisted learning resources accessible to children in conflict and crisis contexts.

In 2018, DFID funded a research study on the learning environment for Grades 2 and 3 in schools in areas of Syria not controlled by the Syrian government (Integrity, 2019b). The study did not report on literacy or numeracy results for pupils. The study bills itself as rigorous although it is more emerging in terms of the level of evidence it provides, due to situational constraints on sampling, heavy reliance on self-reporting in certain domains and the lack of data on learning or wellbeing outcomes. The study was broad in scope, however, in the non-government-controlled area, reaching 300 schools, and collecting information from 2,195 teachers, 1,779 children, 1,195 parents/caregivers and 411 others.

The study reports that these schools in Syria do generally use the government of Syria curriculum or one based on it/very close to it developed by the Syrian Interim Government. Interestingly, teachers reported high levels of competence and self-efficacy; they also stated that they were able to provide instruction that was conflict sensitive. However, classroom observations revealed a lower level of competence in using best practices for EGR and EGM: “...only 60 percent provided opportunities for language manipulation,

²⁴ See samples on YouTube and in the iTunes store, respectively: <https://www.youtube.com/watch?v=ee5ILY37vrY> and <https://itunes.apple.com/us/app/antura-the-letters-arabic/id1210334699?mt=8>

and only 59 percent of teachers used multiple teaching techniques to support children in reading comprehension. In math classes, only 61 percent of teachers were observed to provide support for the establishment of number sense or practicing multiples (Integrity, 2019b p. 16 p. 16).”; under observation teachers did model sound instruction related to promoting student wellbeing, but pupil interviews revealed that there was a high level of corporal punishment in the schools. The study further revealed that learning hours were insufficient, there was a high level of teacher absenteeism and, according to school directors, teacher morale was low. Further, teachers and the school director did report high levels of stress among students, despite the fact that school safety has improved (Integrity, 2019a, 2019b). Overall, the study demonstrates that there is a high level of stress, on the part of teachers and pupils, and that the school environment lacks resources and teachers need more professional development to improve their teaching of basic skills.

Literacy and numeracy outcomes for children with disabilities: There has been some slow progress in this area. Significantly, the issue of teaching children with disabilities now seems to be more prominently on the radar of educational policy makers across the region. Studies on the education of children with disabilities in the MENA region indicate that there are common issues across countries (Hadidi, 2015), suggesting that common solutions could be developed and implemented across contexts, saving the time and money it would take for each country to develop solutions individually. Parental recognition of the issue of disabilities has grown as evidenced by the use of home testing (i.e. the Project Portage model of home-based instruction to mothers to help promote the development of young children with developmental delays; see, for example (Cameron, 1997), or the more recent Early Start Denver Model, a behavioral therapy for children with autism between the ages of 12- 48 months; see, for example, (Giacomo V., 2014)) (Hadidi, 2015). While these tests have been used across the region to screen for children with disabilities, which is an important step in the right direction, there needs to be better systematized use of these tools.²⁵

Regional Policy Reform Initiatives

Ministries have moved toward policy reforms regarding the teaching of early grade reading. Egypt, Jordan, Lebanon, Morocco, the West Bank and Yemen have all taken steps to revise early grade reading curriculum, train teachers on teaching early grade reading, and produce new and more “reader-friendly” classroom materials. There have been similar initiatives in Gulf countries. There are still challenges to be addressed vis à vis EGR, but MENA countries have a demonstrated will to push forward.

Donor-assisted projects with an explicit focus on early grade mathematics are still in their early stages. However, EGM is now on the policy agenda and awareness of the enabling relationship between early grade math and reading skills is growing in the region and countries are undertaking steps to reform curricula and train teachers to better teach EGM.

Instructional Practice

Reading: Project results, as well as MOE action, indicate that teachers are now explicitly teaching phonemic awareness and basic phonics (alphabets). In the Snapshot of School Management Effectiveness Surveys (SSMEs) done between 2011 and 2013 in MENA countries that implemented EGRA (Egypt, Iraq, Jordan, Morocco and Yemen), this was not evident. In many school systems, teachers still started lessons with a text on the board, which students recited and ultimately memorized. Teachers went from the text, down to sentences, and then to words; little attention was given to foundational skills and children were not reading (A. Brombacher, Collins, P., Cummiskey, C., de Galbert, P., Kochetkova, E., & Mulcahy-Dunn,

²⁵ According to Hadidi (2015), Project Portage was introduced in 1984 in the Gaza Strip and then in the 1990s in Egypt, Yemen, Saudi Arabia, Lebanon, Jordan, UAE, Oman, Qatar, Bahrain, Morocco and Kuwait; the Early Start Denver Model was introduced more recently, mainly to Gulf countries such as Saudi Arabia, Qatar, Kuwait, UAE, Oman and Bahrain.

A., 2012, Oct. 4 revised; A. Brombacher, Collins, P., Cummiskey, C., Kochetkova, E., & Mulcahy-Dunn, A., 2012; Collins, 2012; International, 2012a; Messaoud-Galusi, 2012). Now, SSMEs and other data from Egypt, Jordan, Lebanon, Morocco, the West Bank and Yemen indicate that teachers are explicitly teaching phonemic awareness and phonics skills in the early grades, especially in Grades 1 and 2. Once trained, teachers seem to be able to effectively teach letters and sounds and it is likely that this material is not hard for them when they have teacher guides or scripted lessons that outline a routine for how to do this in the classroom.

The World Bank assessed a group of EGR projects for effectiveness, including interventions in Egypt and Jordan (J. K. Graham, S., 2018). The 18 EGR interventions included in the study all included teacher training on evidence-based curricula and the provision of instructional materials; the majority also included the provision of instructional guidelines, follow-up coaching and monitoring and “other components” (J. K. Graham, S., 2018, p. 12); only 5 out of 18 interventions included the provision of tools and training for student assessment. Both the Egypt and Jordan interventions, as well as several others in the study, showed substantial impact (defined in the World Bank report as effect sizes greater than 0.25 standard deviations). The Egypt and Jordan interventions had effect sizes of 1.07 and 0.48 in letter sound and letter name recognition and 0.55 and 0.46 in oral reading fluency, respectively. While the effect sizes were substantial, “they were more substantial for the less advanced subtasks” (J. K. Graham, S., 2018, p. 13) and note that “large effect sizes can clearly still equate to somewhat small gains in absolute terms” (J. K. Graham, S., 2018, p. 14). To put this into perspective, in Egypt ORF for the treatment group improved from 11.8 cwpm to 26.9 cwpm and in Jordan this measure improved from 14.4 cwpm to 21.3 cwpm. While impressive and statistically significant ($p < .01$), students are still not reading at a sufficient rate of fluency.²⁶ No data were included in this report for Egypt and Jordan relative to reading comprehension.

Mathematics: A final report on an EGR and EGM pilot activity in Jordan also offers some interesting insight relative to teachers’ work. In the pilot intervention, teachers were given a teacher’s guide, daily lesson notes, and a students’ workbook. All were collaboratively developed by the MOE and the project. The project also asked teachers to spend 15 minutes of each class reviewing and reinforcing foundational reading and math skills. In addition, supervisors were trained and visited teachers’ classrooms who were participating in the intervention. The pilot achieved strong results in both EGR and EGM. Supervisor visits seemed to have a large impact: “93 percent of teachers with frequent supervisor visits were in top performing classrooms” (A. Brombacher, Stern, J., Nordstrum, L., Cummiskey, C. & Mulcahy-Dunn, A., 2014, p. 5) al., 2014, p. 5) and “63 percent of teachers who attended both training sessions were in top performing classrooms for mathematics, as compared to only 11 percent of those teachers in classrooms who did not attend both trainings” A. Brombacher, Stern, J., Nordstrum, L., Cummiskey, C. & Mulcahy-Dunn, A. (2014, p. 6). In addition, “89 percent of the mathematics classes in all-girls schools were in top performing classrooms” and “84 percent of the classes in which teachers marked all of the work in the student workbooks sessions were in top performing classrooms for mathematics” while “80 percent of the classes in which teachers monitored student understanding by asking for further explanations were in top performing classrooms for mathematics” (A. Brombacher, Stern, J., Nordstrum, L., Cummiskey, C. & Mulcahy-Dunn, A., 2014, p. 6). In addition, the teacher notes proved important as well since “69 percent of the classes in which teachers followed the notes and routines of the intervention with fidelity were in top performing classrooms for mathematics” (A. Brombacher, Stern, J., Nordstrum, L., Cummiskey, C. & Mulcahy-Dunn, A., 2014, p. 6). While this is one example, there is evidence from other projects that instructional practices vis à vis EGR and EGM are slowly improving.

²⁶ A sufficient fluency rate has not been firmly agreed upon for Arabic; in 2014, Ministry officials in the West Bank agreed to targets of between 30 and 35 correct words per minute; by way of comparison, in English 60 correct words per minute by the end of Grade 2 is generally considered an indication of sufficient fluency. It is important to emphasize that fluency is not simply reading fast but reading with good prosody or expression.

Supplementary Materials

Finally, there has been progress overall in the development of supplemental reading and math materials, including leveled readers. For example, the Global Book Alliance's digital Library now has free Arabic story books and STEM-themed readers that can be downloaded for use (<https://digitallibrary.io/ar>).

Least Progress

Across the Arabic speaking world, progress on the achievement of higher order skills in reading and mathematics has been very slow.

Reading: All reviewed countries struggled in decoding, especially in ORF and reading comprehension. For example, Jordanian Grade 3 students declined in ORF by almost 3 correct words per minute (cwpm) from 2014 – 2017, and Grade 2 made a small gain of just over 2 cwpm in this same period for ORF. Reading comprehension in Grade 2 improved only slightly and although comprehension improved in Grade 3, students still got less than one-third of the six questions correct. In Morocco and Jordan, there was some progress in nonword reading or decoding, but most students still could not decode half of the 50 words in this subtask. Moroccan students made statistically significant gains in ORF: the treatment group improved from 5.94 cwpm to 26.31 cwpm at endline, but this was still less than half of the 59 words in the passage they were required to read aloud. Further, out of five comprehension questions, even at endline, students in both the control and treatment groups only answered slightly over one question correctly.

Mathematics: The same is true in mathematics, where higher order skills such as level 2 addition and subtraction, identifying missing numbers and word problems still need more attention. This pattern was consistent across both EGMA and TIMSS and PISA, vis a vis mathematics. Progress is lagging on more conceptual items, such as identifying missing numbers, Level 2 addition and subtraction, and word problems. Pupils from the MENA region tend to perform better on the more procedural items such as number identification, quantity discrimination and addition and subtraction at Level 1.

Instruction is very procedural and children memorize but do not apply and practice mathematical skills to the degree necessary (Faour, 2012; Matar, 2013).

Marginalized Children

Progress has been slow in terms of providing opportunities for high quality early grade reading and numeracy education for children both in conflict and crisis contexts and with disabilities.

Literacy and numeracy outcomes for conflict-affected children in the region: Ongoing conflicts in the MENA region have had devastating effects on children's education and learning outcomes. (For more information see: <https://www.edu-links.org/topics/education-crisis-and-conflict>). Although evidence is sparse, as indicated, results from the assessments in Syria indicate that children in conflict and crisis situations are not developing foundational skills in reading and math. This could be due to missed or interrupted schooling due to the effects of conflict such as lack of safety going to school, destroyed schools, missing teachers, targeting schools, and fleeing home.

Literacy and numeracy outcomes for children with disabilities: Service provision in special education has grown across the region but it is still severely lacking. While Arab countries have signed on to United Nations (UN) agreements on the education of people with disabilities, which include commitments to inclusive education, inclusion is a relatively new idea and thus not widely implemented. The larger point, though, is that educational services, whether in inclusive classrooms or in separate special education classrooms, have been sorely lacking for children with disabilities for years. Even in wealthier MENA countries, funding for education services for children with disabilities is limited.

Hadidi (2015) notes that there are common issues across countries that contribute to the somewhat

dismal situation. These issues include the fact that basic information on disabilities is generally lacking: children with disabilities are not accurately diagnosed or counted and those receiving special education not tracked. Moreover, across the region, there are negative perceptions of children with disabilities as burdensome to society, which can influence whether parents seek out educational services for their children with disabilities (Hadidi, 2015).

In 2016, RTI International prepared *Morocco Disability Analysis: Report Summary, Findings and Recommendations* (RTI International, 2016a) as a first step in considering issues of education, particularly EGR and EGM for students with disabilities. Numerous policy challenges were identified in this single country study, echoing Hadidi's findings:

- Disabilities are not defined in education policies and laws, much less education and services for children with disabilities.
- There is a lack of quality control and proper standards and regulations for education programs for children with disabilities
- Laws and policies do not provide the specificity required to ensure all children with disabilities have access to quality and equitable education.
- Laws and policies tend to use a medical model as opposed to a social/human rights approach
- Schools are not wheelchair accessible
- There are no policies to test children for hearing, vision and learning difficulties in school
- There is a dearth of standard screening tools (and the ability to use them) in schools
- Few assistive devices are available to support learners with disabilities who might need them
- Teachers are unaware of simple adaptive techniques they could use or classroom accommodations that they could make to assist children with disabilities who are in mainstream classrooms

Regional Policy Reform Initiatives

Ministries face daunting challenges in improving the teaching and learning of EGM and EGR. The process of training/retraining in-service teachers, reforming pre-service training to produce competent EGR and EGM teachers from the beginning, implementing curricular reform, developing new textbooks, teacher guides, student workbooks and other materials that align around best practice in EGR and EGM is a technical and political challenge, one that involves a change of culture from the classroom to the school, to the district and on up to the MOE itself.

In terms of reading, there is a long history of how Arabic is taught (Taha, 2016) and embedded assumptions on how it is best done. Most teachers today were educated through traditional Arabic teaching methods and this frames their teaching of EGR. While development projects have focused on reading, as a subject within Arabic, it is likely that the teaching of Arabic writ large needs reform in order to reinforce reading skills, particularly higher order skills. Because projects have relied heavily on the US National Reading Panel research and recommendations, they have adopted the focal areas and strategies coming out of that research and passed these on to Ministries of Education. While the research is solid and applicable to reading in Arabic, it is also Anglocentric and often not fully tailored to the nature and structure of the Arabic language. These are next steps that Ministries will have to take and there are, or will be, challenges in terms of capacity for curricular and teacher professional development reform, inertia (“we have always taught Arabic this way...”) and resources to accomplish all of it.

As a corollary to the above, with a specific focus on mathematics, although there was strong evidence that the pilot EGR/EGM intervention in Jordan supported mathematics learning in the early grades, teachers expressed mixed feelings about it. Teacher interviews suggested that teachers liked both the intervention and the training, but when queried as to whether the intervention should be continued, a substantial majority responded that it should not be. Teachers reported that the project was an additional burden to their “normal” duties and viewed it as an “add-on.” This finding speaks to the importance of integrating

new teaching approaches, tools, and the like into teachers' normal work. It also suggests that teachers might not see how these project interventions are designed to replace some of the existing teaching work that teachers do rather than increase their workload. Teachers may also feel they need to "cover" the curriculum and do not feel they have permission to substitute math lessons with new tools and approaches for their existing ones. This suggests that teachers need help in integrating project interventions into their daily practice and need policies that give them permission and support to substitute interventions in place of what they normally do as opposed to adding them on. These are issues that will need to be addressed through policy reform.

Instructional Practice

While teacher training and professional development activities vis à vis reading and mathematics have been ongoing, teacher practice in the classroom has not improved to the degree necessary. Teachers still focus on rote learning and lower order, easier to teach skills. Teachers themselves are often not confident in teaching high-order skills (i.e. writing and comprehension in reading and patterns and word problems in mathematics).

Supplementary Materials

While there has been improvement in the availability of supplementary materials, they are still not ubiquitous in all schools, especially in rural areas in the MENA region. In addition, even if available, teachers need training in how to best use them. There has traditionally been a bias against putting nice new materials in the hands of children for fear they would get dirty, damaged or lost. However, children need reading materials and time to read if they are ever to truly develop as readers. Hence, this bias needs to be overcome. Likewise, teachers need to receive training on using the supplementary materials. Finally, in many places, the textbook functions as the curriculum and the main reading material that students have, despite the fact that many textbooks do not align with best practice as regards reading instruction. In mathematics, students need hands-on "manipulables" to use in mathematics lessons. These do not need to be costly and can be made from local materials, but teachers need to orchestrate this and make sure that students bring or make the types of materials (macaroni, pebbles, sticks) that can be used for application and practice in math lessons.

IV. RECOMMENDATIONS FOR FILLING GAPS IN ACHIEVEMENT

EARLY GRADE READING RECOMMENDATIONS

Expose children to MSA consistently, both inside and outside of the classroom.

Research has consistently shown that negative impacts from diglossia can be mitigated or avoided by exposing children early to MSA (Feitelson 1993, Iraqi 1990, Abu-Rabia 2000). For example, Feitelson et. al. explored in 1993 how listening to stories in MSA would impact kindergarten students' emerging literacy skills. In this experimental study, teachers read stories to the children in the treatment group daily for five months. This was the only difference in treatment. Students in this treatment group performed significantly better on listening comprehension tasks in literary Arabic and scored higher on two measures of the active use of language, using richer vocabulary and more clauses when recounting the stories using picture sequences.

In 2000, Abu-Rabia examined the impact of early exposure to MSA on reading comprehension for children exposed to literary Arabic consistently in preschool. In this study, students exposed to literary Arabic in preschool, as well as those in a control group who were not exposed to literary Arabic, were tested at the ends of Grade 1 and Grade 2. Treatment students performed significantly better on reading comprehension tests than control students. Levin et al. (2008) similarly found that Israeli and Palestinian kindergartners of lower socioeconomic status who were exposed to literacy-related activities using MSA for 25 minutes a day outperformed their peers in the control group who were not exposed to literacy-related activities, such as, naming letters and identifying their sounds. In particular, the treatment group was able to use standard MSA letter names, which indicated that “exposure to the standard names of letters enhanced alphabetic awareness using these names” (Levin et al., 2008, 424).

More recently, Leikin, Ibrahim and Eghbaria (2014) found that although “exposure to Literary Arabic at a young age is informal and indirect, pre-school children are able to use linguistic structures from the literary language and to comprehend narrative texts (733).” They concluded, “Based on our findings and in view of the fact that reading acquisitions occurs in a “foreign language environment,” [due to the diglossic context] it may be suggested that the Arab child must start learning Literary Arabic as early as possible (Leikin, Ibrahim, and Eghbaria 2014, 745).

Reading takes practice: Ensure that children have time to read aloud and silently.

Teachers in the MENA region frequently use choral reading (H. Boyle, Al Ajjawi, S., & Xiang, Y., 2014), which can lead to the memorization of texts as opposed to actual reading. It is important to give students the time to read aloud to each other and encourage students to read aloud in the home to parents or siblings. In the early grades, recommendations vary in terms of reading time, but 15 minutes seems to be the most commonly recommended amount of time. For younger children this might be shortened to align with pupils' ability or attention span. Other strategies for younger children could be to pair them to read aloud to each other or explain what they see in the pictures in a book to each other.

Likewise, Abu-Rabia noted that: “Silent-reading comprehension is less demanding, because the reader can rely on orthography, morphology, and other resources” (Abu-Rabia, 2002). When reading aloud, one must include the proper endings based on the word's function in the sentence; sometimes these endings are indicated by long vowels and consonants but sometimes only by diacritical markings (which are usually not there on a written text). With silent reading, pupils have the chance to “unpack” the text, remark on the clues in the sentence, and then read it aloud with more accuracy. SSMEs indicated that pupils in many of the countries with donor-funded projects had almost no class time for independent reading (A. Brombacher, Collins, P., Cummiskey, C., de Galbert, P., Kochetkova, E., & Mulcahy-Dunn, A., 2012, Oct. 4 revised; A. Brombacher, Collins, P., Cummiskey, C., Kochetkova, E., & Mulcahy-Dunn, A., 2012; Chemonics International, 2017; Collins, 2012; International, 2012b; Messaoud-Galusi, 2012). More silent reading time may strengthen students' proficiency in ORF and in developing vocabulary, honing morphological and syntactical awareness as well as orthographical (spelling) skills. Projects have also

demonstrated that encouraging reading at home, educating parents about the importance of reading, and encouraging home reading activities can also make a difference.

Continue to focus on phonological and phonemic awareness and phonics...

The teaching of phonological and phonemic awareness has received a lot of attention in recent years and research findings on the importance of phonological and phonemic awareness have translated into new approaches in curriculum, materials, and classroom teaching. Students' are progressing in letter sound recognition, rapid letter naming, and nonword and familiar word reading.

Recent studies (Al-Hmouz, 2013; Al Ghanem, 2014; Asaad, 2014; Batnini, 2015; Makhoul, 2017b; Tibi & Kirby, 2018) confirm that phonemic awareness skills are a predictor of reading success in the early grades. Batnini's and Uno's study on Grade 3 students in Tunisia asserted: "Overall, the results of the current study suggest that phonological processing and automatization are good predictors of Arabic reading ability, whereas phonological processing alone is a unique predictor of Arabic spelling ability in Tunisian third grade children" (Batnini 2015, 589-590). These findings and previous findings (Abu-Rabia 2006; Calfee, 1998; Elbeheri, 2007; E. Saiegh-Haddad, 2004; E. Saiegh-Haddad, Levin, I., Hende, N., & Ziv, M., 2011; Taibah, 2011) attest to the importance of the development of sound phonological and phonetic awareness. GILO, RAMP, RFS and others have demonstrated success in emphasizing phonological and phonemic awareness.

However, phonics is not enough

In Morocco, for example, the MNE is piloting a new EGR curriculum and set of materials that focus on "the phonetic approach," combined with story reading to build vocabulary. Another important function of story reading, in addition to vocabulary-building, and is exposing children to MSA, including its syntactical conventions, endings, pronunciation, etc. It is critical, especially in diglossic contexts, to build listening comprehension skills, which are a critical part of learning to read. Likewise, Jordan, Lebanon, the West Bank and Egypt activities have all emphasized a phonetic approach to varying degrees, combined with some expanded presence of age-appropriate texts and stories for classroom use.

Develop instructional strategies and materials to more directly develop and reinforce syntactical and morphological awareness.

The importance of syntactical and morphological awareness in successfully learning to read has been well documented in the research and summarized above, however this research has not yet been translated into instructional strategies and materials. If research was translated into instructional strategies and materials, there would likely be more comprehensive improvement in EGR skills, especially in ORF and comprehension.

Ensure an expanding supply of engaging, grade and age appropriate reading materials for students to access.

Students do not learn to read without reading. While textbooks are generally available in MENA region schools, story books and other "fun" reading materials are not as readily available and they must be, if children are going to truly develop strong reading skills.

Engage supervisors in mentoring teachers and helping to keep them on track in terms of using best practices in EGR instruction.

Supervisor engagement seemed to be a promising practice in the Jordan reading and math pilot activity and it seems to represent a way to involve different levels of MOE systems in the process to improve EGR and raise awareness of the importance of doing so. Additionally, supervisor engagement is a tool for ensuring that teachers implement new and potentially challenging instructional strategies with fidelity.

Continue to train EGR teachers in best practices, including how to better teach some of the higher-order or more complex skills of reading, such as comprehension, and monitor student performance in reading.

Effective EGR teaching involves skills and knowledge that many teachers in the MENA region have not been exposed to. Training through a variety of formats is the way to disseminate those skills and knowledge.

Not enough emphasis has been put on teaching comprehension skills and strategies. In the Landscape Report on Early Grade Literacy, there is a recommendation to “Directly teach reading comprehension strategies (Shanahan et al., 2010)” (Y.-S. G. Kim, Boyle, H.N., Zuilkowski, S.S., & Nakamura, P., 2016, p. 34). The report explains: “Reading comprehension strategies include questioning, visualization, text structure (how information is presented), summarizing, and retelling. Teachers should ask what, when, where, why, and how questions, and encourage students to raise questions as they read texts. Teachers should verbally express their own comprehension processes as they read passages. For instance, when the teacher reads a sentence that does not make sense, the teacher pauses and says, ‘This part does not make sense to me. Let me reread this sentence’” (Y.-S. G. Kim, Boyle, H.N., Zuilkowski, S.S., & Nakamura, P., 2016, p. 34). The techniques suggested by Kim et. al., which include questioning, visualization, summarizing, and retelling, can also serve as ways to monitor student performance in reading comprehension, vocabulary acquisition, MSA proficiency in listening and speaking, as well as other sub-skills critical to learning to read in Arabic.

Consider curriculum revision to ensure that reading is taught coherently and comprehensively within the larger Arabic language curriculum.

Since most MENA countries teach reading through the larger Arabic language curriculum, important skills are often not taught with the intensity that they need. Sequencing the teaching of skills can also be problematic. Concentrating the key elements of teaching reading and writing in a coherent manner will ensure that important skills are not omitted, that they are taught in a logical sequence, and that they are reinforced by, and reinforce, other elements of the larger Arabic curriculum.

EARLY GRADE MATH RECOMMENDATIONS

Focus on more conceptual, higher order skills such as number patterns, Level 2 (i.e. more complex operations) in addition, subtraction, and word problems.

As with early grade reading, data indicate that early grade mathematics instruction is less focused on higher order skills involving critical thinking and problem solving. This could be because these skills are harder to teach and because teachers lack confidence in their own ability to teach these skills. Nonetheless, this is a gap in MENA region instruction in mathematics and supporting teachers to address these higher order skills is critical to overall improvement.

Focus on applying skills and reasoning and less on memorizing facts and procedural aspects.

The greatest lessons around EGM are the need to closely monitor student learning, reinforce foundational skills, and provide students time to do hands on work, whether individually or in pairs/groups. Supervisor and coaching visits also seem to have an impact on the fidelity of the implementation of the new approaches and practices in the classroom. Jordan data suggests that there is a statistically significant improvement in mathematics performance on the more conceptual mathematics tasks, such as doing mathematics with understanding. Teacher training and materials for mathematics developed for Jordan might prove to be worthy of replication.

Students need to understand the underlying concepts behind the mathematical operations they are learning so that they can apply them to solve problems. Using problems from daily life could help students to see the connections between classroom math and real-life numerical problems and give them the opportunity to apply what they learn. As such, teachers need to know how to construct hands-on lessons

that require students to go beyond memorizing facts to applying concepts. This will require training teachers to reconfigure how they teach math and even reworking textbooks and other instructional materials that are used in the classroom.

Ensure a greater supply of hands-on mathematics teaching aids, ideally that students can use themselves in the classroom.

While textbooks are generally available in MENA region schools, hands-on “manipulables” to support math instruction and learning are often not. Students need additional materials that they can manipulate and work with themselves to move beyond basic operations to application and reasoning.

Engage supervisors in mentoring teachers and helping to keep them on track in terms of using best practices in EGM instruction.

Supervisor engagement seemed to be a promising practice in the Jordan reading and math pilot activity and it represents a way to involve different levels of Ministry of Education systems in the process to improve EGM and raise awareness of the importance of doing so. Additionally, engaging supervisors is a tool for ensuring that teachers implement new and potentially challenging instructional strategies with fidelity.

Continue to train EGM teachers in best practices, including how to monitor student performance in math.

Effectively teaching EGM involves skills and knowledge that many teachers in the MENA region have not been exposed to. Training through a variety of formats, and teaching assessment techniques that can be used in a variety of classroom structures, is the way to disseminate those skills and knowledge. Incentivizing early grade reading and mathematics teachers through certification programs and other forms of professionalization could help to improve the adoption of new instructional practices and approaches in the classroom.

MISSING RESOURCES

There are several missing resources that continue to inhibit students’ success in reaching literacy and numeracy benchmarks. The most critical missing resources fall into two categories: teacher skills and knowledge and physical materials, such as supplemental reading books and math manipulables. The presence and availability of appropriate reading materials at home and in school beyond just the textbook correlates with higher EGRA scores. Related to issue of teacher skills, students often lack time to learn to read, even if storybooks and other materials are available in schools. Students need adequate time in school to read; time spent reading in school and in the home correlates with better reading performance, as does daily attendance at school. Moreover, improved data collection at the country level by MOEs on primary grades reading and mathematics performance relative to country benchmarks would also constitute a very useful resource at central, regional, and local levels within national ministries to understand the magnitude of the problems in these subject areas and better allocate resources to areas with the greatest need.

V. QUESTIONS FOR FUTURE RESEARCH

There is significant further research that both the international development and academic communities can conduct to address gaps in EGR and EGM in the Arabic-speaking world. Action research should be conducted to explore how to translate the findings reported above, particularly the section on existing gaps, into classroom-based practices, strategies, and materials to improve EGR and EGM. This section outlines proposed questions or lines of inquiry for future research, along with discussion of why these topics are important and relevant. There is significant further research that both the international development and academic communities can conduct to address gaps in EGR and EGM in the Arabic-speaking world. Below are suggestions for questions that future research could explore, along with a discussion of the importance and relevance of these topics.

What is the best and most accurate way to assess early grade reading skills for students learning to read in Arabic? Does the EGRA tool test all of the sub-skills that are important to learning to read in MSA?

First, start with expanded and more regular assessments. The EGRA, a tool that has been used widely worldwide, is research-based and is well established within the international reading community. In each case where EGRA is used, the EGRA tools are translated into local languages and adapted to the target language. However, additional adaptations of the EGRA tool might be required in the context of learning to read in Arabic. Considering this report's research findings, particularly regarding the roles of phonological awareness, morphological awareness, and vocabulary and syntactical awareness, research should look at the appropriateness of the EGRA tool for both Grade 2 and 3 students.

A great deal of research points to the importance of phonological awareness in learning to read and as a predictor of reading success. However, research also points to the fact that children rely less on phonological awareness as they move through the early grades of school. By Grade 3, children rely less on phonological awareness and more on morphological and syntactical awareness. Should there be an EGRA subtask that focuses on morphological awareness? It may be important at this stage to provide children with a variety of short verbal and nominal sentences to read instead of isolated words. It might be appropriate to provide students with words from word families (cognates to familiar words) to decode and check whether they are able to detect root words and patterns. At the Grade 3 level, are invented words appropriate? The EGRA measures test phonological awareness but do not allow children to draw morphological awareness and knowledge of word patterns in Arabic.

The subtasks included in the EGRA measures at Grade 2 and 3 should be reconsidered. In addition, given the evidence that diacritics can slow down fluent reading as children progress in schools, further research on what fluent reading looks like for beginners, who rely heavily on diacritics, versus for Grade 3 and 4 readers, who are transitioning to reliance on other tools like morphological awareness is needed. Further, could reading fluency be increased by limiting the use of diacritics in ORF subtasks? Including diacritics on ambiguous words can be helpful but including them on all words might slow down students' performance.

Many of the academic studies cited in this study include methods for measuring morphological awareness, use and awareness of literary Arabic, and discerning how students use syntax and vocabulary in reading comprehension. Ministries, non-governmental organizations (NGOs), and donors should examine some of the methods used in these studies, with an eye to evaluating whether any them can and should be incorporated or adapted into the EGRA tools used in Arabic-speaking countries.

What knowledge regarding EGR in Arabic are we not teaching or not teaching in sufficient depth in EGR MENA classrooms?

The EGRA results from some MENA countries as well as the PISA results over the last two administrations suggest that while there is progress in EGR, there is also a need to focus more on the teaching of reading beyond basic skills. Progress is not consistently translating to the higher ORF and comprehension results,

or to listening comprehension skills. Why is this? Ministries and donor-funded initiatives have focused on reforming how EGR is taught and phonological awareness and phonics have been emphasized. PISA scores for Grade 4 students in participating Arabic speaking countries have generally improved but are still below PISA's international benchmarks. These results suggest that skills beyond phonological awareness and phonics are not as well reflected in curricula as they should be and perhaps are not taught as explicitly and directly as is necessary in support of the reading process. This is a broad research area and there are many strands to examine, as outlined below.

What strategies are currently in use, in national curricula and in donor-funded initiatives, to teach morphological awareness, vocabulary and syntax in the early grades?

Given what the most up-to-date research says about the teaching and learning of reading in Arabic, it is important to understand not just how teachers teach letters and sounds, known as word reading, but how teachers teach word families, word patterns, and comprehension strategies that relate to sentence context like vocabulary, morphological awareness and syntactical awareness. Studies that focus on these questions regarding actual classroom practices across the MENA region today are not available. Since reading is embedded in larger Arabic language curricula, it is important to examine how those curricula conceptualize, present, and guide teachers to teach these specific aspects of Arabic language would be helpful in understanding why students are not making as much progress as Ministries and the global reading community would like to see, as well as in identifying gaps in how these skills are leveraged or reinforced in relation to EGR. A concomitant review of Arabic language textbooks is needed.

Ministerial Arabic language curriculum developers are experts in the Arabic language. However, there could be new research insights to draw on to make what is often seen as complex material in the Arabic language more accessible to young children in the early grades. In many cases, Arabic language textbooks and curricula take a "grammatical approach" to the teaching of Arabic language because it is such a complex and rich language. While students need to study grammar, they also come to school with a great deal of knowledge of Arabic syntax, derived from some spoken dialects. There could be ways to leverage children's existing knowledge to build morpho-syntactic knowledge without going directly to teaching grammar, which could be quite challenging to early grade students. Understanding how morpho-syntactic skills are taught in the early grades is important to inform EGR materials development, curriculum revision, and teaching approaches in the MENA region.

What pedagogical strategies are most useful in managing diglossia in EGR classrooms?

This is a broad area for research and the research recommended immediately above would likely shed some light on this question. Interviews conducted under the *Topical Analysis on Early Grade Reading Instruction* in Arabic speaking countries in 2013 suggested that teachers often use dialect in the EGR classroom to help students bridge dialect and MSA. Is this an effective strategy? Are there other ways to bridge the gap? Research cited above suggests that students need to develop listening comprehension skills in MSA as a component of learning to read in MSA. It would be very relevant to study how frequently teachers talk to students in MSA in early grade classrooms and how strongly they emphasize listening comprehension in MSA. Teachers may not be in the habit of talking conversationally to students or devoting 5 minutes or more at the start of each class to this sort of "warm up." Teachers themselves might need assistance such as conversational prompts, to speak in MSA to their students. A study on "teacher talks" in EGR MENA classrooms, including classroom observation of early grade reading classes and other early grade Arabic language classes, as well as interviewing teachers on which language they use in the classroom most regularly, how much time they spend talking to students, how they believe listening comprehension can and should be built into the class, and what strategies they think are effective in addressing diglossia would be very instructive in formulating pedagogical guidance to help teachers in mitigating diglossia and building listening comprehension skills (See Kim 2016 for a discussion of E3 strategies, p. 27 which could be a research framework for analyzing the quantity and type of talk teachers use with students in EGR classrooms in the MENA region).

Should there be a formal high-frequency sight-word list used across the MENA region?

While Oweini (2010) explored the idea of sight word lists for Arabic language there is need for the development of a more formal sight word “lexicon” that could be used across the MENA region. These high frequency words can be a valuable tool in teaching early grade reading skills and can be used in developing the reading textbooks for reading instruction. These high-frequency words would need to be introduced through textbooks and other materials in a rational order (i.e. shorter, concrete words first) and used repeatedly so that children are consistently exposed to them. (See Boyle and Salah 2017 for a discussion of how lexical items could be better chosen and sequenced in Egyptian Grade 2 textbooks, for example.)

How are reading comprehension strategies taught in EGR MENA classrooms today?

Comprehension is the ultimate goal of reading. A better understanding of how it is (or isn't) taught in classrooms is needed. Do teachers employ techniques like the “Thinker’s Spinner” developed by Save the Children referred to in the *Landscape Report on Early Grade Literacy* (Y.-S. G. Kim, Boyle, H.N., Zuilkowski, S.S., & Nakamura, P., 2016, p. 36) which asks children to predict, explain, evaluate and summarize stories they listen to or read? Are teachers aware of and able to teach comprehension strategies?

How is writing taught in MENA countries and is it perceived as a tool that reinforces reading?

While this report extensively addresses early grade writing skills in the MENA region, there is a great deal of research globally that asserts the importance of writing to reinforce reading skills development in the early grades.²⁷ It is unclear how writing is taught, but some evidence suggests it is taught in terms of penmanship and spelling, which are important, but implies that writing is not taught as a tool of communication. Kim et. al. (2014) say, “Many teachers in developing countries believe that it is not appropriate for children to write until they can write properly (typically in Grade 4 and beyond, EDC, 2013*, 2014a). However, sentence and paragraph writing should not wait until students develop conventional spelling skills” (Y.-S. G. Kim, Boyle, H.N., Zuilkowski, S.S., & Nakamura, P., 2016, p. 39). While many teachers do not approve of invented spelling and are wary of reinforcing student errors, invented spelling is one-way students “crack the code” of learning to read and write. Basic writing should be part of EGR lessons; such as, labeling pictures or writing sentences about images or stories that children read or that are read to children. The extent to which children write at all, beyond learning to write letters correctly and copying text off the board, has not been studied extensively in the MENA region and deserves attention.

How do we translate the findings from the experimental and quasi-experimental studies on learning to read in Arabic, cited in the section on “gaps” above, into curriculum, materials, pedagogical guidance and instructional strategies for use in MENA classrooms?

The “answer” to this question may depend, in part, on findings from the research recommendations immediately above. The body of rigorous research on learning to read in Arabic has grown over the past 10 - 20 years and contains a plethora of relevant and useful findings. Likewise, research on early grade mathematics education from various countries could provide useful insights and new ideas for practice. These have not yet been deliberately, thoughtfully, or fully translated into practical, Arabic language specific approaches to use within Ministries, projects, and classrooms. This process needs to happen for EGR in particular and the process should involve Ministry of Education curriculum and textbook writers, teachers, donor-funded initiatives and personnel, and if possible, the researchers who carried out the studies. Findings need to be communicated to stakeholders in a clear manner, including suggestions debated for

²⁷ See: Berninger, 2002; Education Development Center, 2014; S. Graham, 2006; S. Graham, Bollinger, A., Booth Olson, C., D’Aoust, C., MacArthur, C., McCutchen, D., & Olinghouse, N., 2012; Harris, 2008; Juel, 1986; Y.-S. Kim, Al Otaiba, S., Puranik, C., Sidler, J. F., Greulich, L., & Wagner, R. K. , 2011; Y.-S. Kim, Al Otaiba, S., Sidler, J. F., & Greulich, L., & Puranik, C., 2014; Y.-S. Kim, Al Otaiba, S., Wanzek, J., & Gatlin, B., 2015; Y.-S. G. S. Kim, C., 2017; McBride-Chang, 1998; McCutchen, 2000; Senechal, 2012).

addressing gaps, promising findings, and plans made for moving forward. This could involve providing research summaries in clear language for Ministries and for Arabic language teachers; or it could involve fora among stakeholders on discussing and addressing gaps; or thorough curricula review in light of topics emerging from the above research to identify where there may be gaps; or even workshops to address gaps through concrete action such as reformulating policies, revising curricula, teacher guides, instructional materials and assessments.

What are the best teacher training policies and configurations to sustainably improve EGR and EGM teaching?

MENA countries and projects within countries have developed and delivered many training materials and training programs that have been used in building the capacity of teachers to teach reading and math. However, there is room to research what types of training policies (in- and pre-service) and training formats or configurations are most likely to be cost-effective for Ministries, feasible and motivating for teachers, and effective in improving EGR and EGM classroom instructional practices. It may be possible to organize a continuum of teaching courses to skill levels and needs and to offer a sustained and progressive training experience to those with no experience in EGR or EGM. The question remains, how can better teacher preparation courses be integrated into existing MOE structures, especially at the pre-service level?

Teacher training is often offered in face-to-face formats; however, there is a need to investigate other affordable and sustainable forms of professional development, perhaps through hybrid models that use both technology, on-the-job training, and traditional face-to-face models. One strand of this research could look at how other countries prepare teachers for the early grades, especially reading and math, and then offer in-service opportunities.

How does school leadership support EGR and EGM instruction in the MENA region? Would revising or reforming aspects of school leadership better support early literacy and numeracy instruction at the school and district levels? How do or should leadership practices regarding ERG and EGM inform national level EGR and EMA policies?

Given the role that school directors, district level supervisors, and inspectors play on the ground, especially in supervising and shaping teachers' practices, some basic research on leadership and its potential role in improving local EGR and EGM performance should be pursued.

Should leveled readers in Arabic be used more widely?

The availability of reading materials, stories, and other texts for students to read is an issue in many countries in the region. Research should look at whether and how leveled readers in Arabic are understood and used, when and if they are available. This line of inquiry could be fruitful. It would seem that there is a need to develop leveled readers in Arabic based on vocabulary frequency, especially since textbooks sometimes contain vocabulary that is not well sequenced, chosen, or consistently repeated and used within the textbook (H. N. Boyle, Salah, W., 2017). Leveled readers are well established in the United States and studies exploring their utility in the MENA region could prove very useful.

Relative to the teaching of EGM, what are the best ways to prepare teachers to catalyze the building of transversal skills such as: problem solving, reasoning & proof, communication, connections and representation?

The literature indicates that these types of transversal skills are instrumental in improving students' understanding of and achievement in mathematics. Available literature and data suggest that early grade mathematics skills are taught in ways that prioritize the memorization of formulas or rules to the detriment of understanding mathematical concepts. Teachers' own grasp of mathematical concepts is weak in many cases, and thus their confidence in teaching mathematics is also weak. This can lead to rigidly structured lessons, reliant on lecture not on active problem solving, explaining one's reasoning,

communicating concepts, making connections and using representations to communicate mathematical ideas. Indeed, these are not areas that teachers are taught to teach in the MENA region, and many would not know where to start if given this slate of skills to teach. Hence there is a need for research on how EGM teachers are prepared, on their level of knowledge and understanding of mathematical concepts, on what training strategies would be most effective in helping them to transform their traditional mathematics lessons.

How can existing national education policies on children with disabilities in the MENA region be better defined and enhanced, so as to provide concrete guidance to educators and insure equitable application?

In many countries in the MENA region the policy landscape around children with disabilities or special needs is insufficient. In some cases, basic definitions of what constitutes a disability is absent. Educational standards for special needs children are not in place and screening of children with suspected special needs is not required. In-depth research on individual countries' policy environments is a necessary first step to begin to flesh out a set of coherent policies to serve children with special needs within the educational system.

How do policy makers, school directors, teachers and parents perceive of the practice of inclusion? What is their understanding of inclusion?

Inclusion is a relatively new concept in the MENA region. It has been adopted and promoted by UNESCO via various declarations that countries, including those in the MENA region, have signed on to. However, it is a complicated concept in many ways and likely interpreted very differently by different groups of educators. Inclusion policies and practices need to respond to stakeholder perceptions as they try to move those perceptions toward a shared and locally feasible state of implementation. An important first step is understanding where stakeholders are in terms of their perceptions of inclusion.

What educational strategies, particularly involving the use of technology, are most effective or have the potential to be effective, in reaching children in conflict areas with quality basic education?

Children in conflict contexts cannot go without basic education. Education is a human right and allowing a generation of children to fall far behind in their education denies them this right and disadvantages the country when it comes out of conflict. Radio, TV, internet and digital resources (for use offline) all offer potential avenues toward reaching children in conflict zones. Which technologies are or could be most cost effective?

Given the number of children experiencing conflict and/or violence, how can teachers and schools help to mitigate the effects of these experiences?

Research on ways in which teachers and schools can help students to deal with the conflict and violence they have experienced could make an important contribution to helping children to focus on learning in the early grades. There are Social and Emotional Learning curricula available but questions of tailoring them to the needs of young children and training teachers to use them are still open and need further exploration.

VI. CONCLUSIONS

This report has detailed an analysis of the existing evidence related to the challenges facing Arabic-speaking countries in the teaching and learning of early grades math and reading. EGRA, EGMA, PIRLS, PISA and TIMSS data all suggest that the MENA region has been steadily progressing, despite some dips in PISA and TIMSS.

However, it is also apparent that children in the MENA region are not learning to read and do math as well as they should be. While they have made progress in basic skills, students across the region are still falling short on some higher order reading and math skills. These results are not exclusively correlated to countries' economic levels. Richer countries in the Gulf States have scored lower on PIRLS, PISA, and TIMSS than other MENA countries, despite well-funded educational systems, well-paid teachers, and well-equipped schools. The higher order skills in EGR and EGM still require more attention and emphasis in terms of policies, curriculum, teacher training, and instructional practices across the region.

There are several actions that deserve more consideration by Ministries and donors as they endeavor to improve EGR and EGM outcomes. These include developing listening comprehension skills in MSA, bridging the divide between dialect and MSA, reinforcing morphological and syntactical awareness, and leveraging these to improve ORF and comprehension. In addition, there is a pronounced need for more access to age-appropriate reading materials in Arabic. With respect to EGM, it will be critical to facilitate the application of mathematical operations to problems and promote more conceptual understandings and reasoning skills.

ANNEX I: DATA ANALYSIS MATRIX

Research Question	Data Sources	Analysis Method
I. What progress in Arabic literacy and numeracy have girls and boys with and without disabilities, in and out of school across the Middle East Region made since USAID investment in early grade reading and numeracy began?	<ul style="list-style-type: none"> • Donor project reports by country • EGRA/EGMA test administrations by country • Other assessment reports, by country and region (PIRLS, TIMMS, etc.) • MOE assessment reports/end of year results that are published, by country (EMIS data, etc.) • MOE policy statements/new policies regarding the teaching and learning of EGR and EGM • Local NGO data or studies focused on EGR or EGM (i.e. Queen Rania Academy, 'Ikra, etc.) • Country policy and/or strategy documents that describe broader efforts to encourage reading or math • Academic literature focusing on reading and math achievement by region or country 	<ul style="list-style-type: none"> • Analysis and comparison of student achievement results in literacy and mathematics by country (looking at pre- and post-test data in particular) • Analysis of post-test data in light of necessary component skills of literacy in Arabic • Assessment of country-specific efforts to broadly (societally) encourage student achievement in reading and math
a. Where has the most and least progress been made?	• See RQ I	• Comparison of pre- and post-test results for reading and math by country
b. What lessons learned and promising practices have been identified in USAID- and non-USAID funded Arabic literacy and numeracy efforts?	• See RQ I	<ul style="list-style-type: none"> • Analysis of project interventions in light of evidence-based practices • Analysis of reports to derive lessons learned and promising practices
c. What approaches to improving early grade math have been most and least successful?	• See RQ I	• Analysis of project interventions in light of evidence-based approaches
d. What human resources development strategies have proven to be successful in terms of equipping teachers with the skills needed to support student-learning outcomes?	• See RQ I	• Analysis of project interventions in light of evidence-based practices related to EGR and EGM instruction
e. What approaches can be adopted/tailored? (e.g. pre-service, in-service, praxis)	• See RQ I	• Examination of above in light of pre- and in-service contextual factors
f. What common challenges and opportunities have these activities faced?	• See RQ I	• Listing and ranking of challenges mentioned in literature examined.
2. What does the existing assessment data, EMIS data, and other data sets say about	• Donor project reports by country	<ul style="list-style-type: none"> • Analysis of gaps in achievement data • Identification of gaps in research base

<p>teaching and learning literacy and numeracy with a variety of learning groups across the MENA region today?</p>	<ul style="list-style-type: none"> ● EGRA/EGA test administrations by country ● Other assessment reports, by country and region (PIRLS, TIMMS, etc.) ● MOE policy statements or new policies relative to teaching and learning EGR and EGM ● MOE assessment reports/end of year results that are published, by country (EMIS data, etc.) ● Academic literature focusing on reading and math achievement by region or country 	<ul style="list-style-type: none"> ● Examination of recent academic literature on best practices in teaching and learning EGR and EGM in Arabic speaking contexts
<p>a. Where are existing gaps in early grade reading and math capabilities among students and educational professionals?</p>	<ul style="list-style-type: none"> ● See RQ2 	<ul style="list-style-type: none"> ● Examination of recent academic and project-based literature on best practices in teaching and learning EGR and EGM in Arabic speaking contexts, including teaching practices, supervision practices, availability of instructional materials and external support for pupils, attendance, etc. categorization of gaps in information, research and project interventions
<p>b. What are ideas for filling these gaps?</p>	<ul style="list-style-type: none"> ● See RQ2 	<ul style="list-style-type: none"> ● Review of best practice literature for teaching EGR and EGM in Arabic-speaking countries
<p>c. What are the missing resources that continue to inhibit early grade reading and math students to succeed in reaching literacy and numeracy benchmarks?</p>	<ul style="list-style-type: none"> ● See RQ2 	<ul style="list-style-type: none"> ● Identification and categorization of challenges identified in literature; examination of inventory of resources used and/or listed as present in EGM and EGR classrooms
<p>d. What additional rigorous research could shed more light on effectively addressing gaps?</p>	<ul style="list-style-type: none"> ● See RQ2 	<ul style="list-style-type: none"> ● Examination of recent academic and project-based research literature on EGR and EGM in Arabic speaking contexts; categorization of gaps in research

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