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EXECUTIVE SUMMARY

For over a decade, international assessments have shown that Arabic-speaking students score significantly lower in reading, mathematics, and science than students of other languages. Country-level analyses of students' reading abilities have furthermore found large deficiencies in Arabic-speaking countries, which may contribute to students' below-average performance in other subjects and international assessments overall. Together with cognitive psychologist Dr. Helen Abadzi, the Al Qasimi Foundation designed and piloted a new early-grade curriculum for teaching Arabic reading that builds on findings from linguistics and cognitive science. A comparison of students' reading ability between the control and intervention group reveals a significant positive impact of the new curriculum, with students in intervention classrooms reading more letters and making fewer errors than their peers. The report underscores the importance of evidence-based design and evaluation of Arabic language teaching and suggests expanding the pilot program to a larger sample of schools across the United Arab Emirates (UAE). Future evaluations should control for student time spent on task, and consider external factors influencing language learning, such as measures of socioeconomic status and parental involvement.

Improving Arabic Reading Fluency: Results from Iqra, an Early-Grade Reading Intervention in Ras Al Khaimah

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Introduction

In the Gulf Cooperation Council (GCC) countries, international large-scale student assessments have taken a prominent role in informing education policy, allowing policymakers and researchers to compare particular education outcomes between countries. A quick look at the recent performance of countries across the Arab world reveals two trends that are cause for concern: first, students across the Arab world perform significantly below the average of the 37 countries of the Organization for Economic Co-operation and Development (OECD), and second, they especially fall behind in reading.

Insights from the cognitive sciences have demonstrated that reading speed and accuracy are crucial for students' comprehension of more complex texts. Therefore, tackling reading fluency is an essential stepping stone for bolstering student performance across subjects.

With this in mind, the Al Qasimi Foundation, together with cognitive psychologist Dr. Helen Abadzi, designed an early grade reading intervention, which builds on recent findings from linguistics and cognitive research that takes into account the Arabic script's unique visual complexities. The resulting Iqra curriculum is a simple low-cost intervention that, based on early pilot results, significantly increases Arabic reading fluency in early grade students.

This paper provides the background, findings, and recommendations resulting from a pilot that was implemented across four primary schools in the Emirate of Ras Al Khaimah, United Arab Emirates, during the 2018-2019 academic year. Encouraging findings suggest that implementing the Iqra curriculum may significantly boost reading speed and accuracy of early grade students, with a potential positive ripple effect on student performance overall.

Background

For over a decade, international assessments, such as the Program for International Student Assessment (PISA) or the Trends in International Mathematics and Science Study (TIMSS) have found that Arabic-speaking students perform at a significantly lower level in reading, mathematics, and science in comparison to their peers. While all participating Arabic-speaking countries scored below the global average, country-level analysis reveals a concerning gap based on the language of instruction, with students taking Arabic-language assessments showing particularly low achievement.

Oral reading fluency describes the ability of a person to read a passage out loud. Reading fluency is not only a predictor of later reading skills, but also a crucial prerequisite for the mastery of all subjects, even mathematics and science. Reading problems can thus be seen as a warning light: If they remain unaddressed, they may result in a widening achievement gap between proficient readers and those struggling with reading speed and accuracy (RTI International, 2017).

While a fluent reader recognizes the look and sound of letters instantly and effortlessly, the underlying speed at which the brain is able to connect them into larger units, such as words, is essential for critical thinking and processing complex texts. Research has found that when readers process text at approximately 45-60 words per minute, it becomes automatic, thus allowing more time for readers to think about the content and less about the process (Abadzi, 2017).

The issue of Arabic-speaking students underperforming vis-a-vis non-Arabic speaking peers is demonstrated by country-level results. For instance, on the 2012 Progress in International Reading Literacy Study (PIRLS) assessment in Qatar, fourth graders in the best-performing Arabic-medium schools scored approximately 105 points lower than Grade 4 students in the best performing international English-medium schools in the country. While the assessment requires the processing of texts that have 800-1000 words, students in Arab countries have often only learned to tackle 200-400 word texts by the end of Grade 3. In comparison with students of other languages worldwide, this leaves them lagging behind the equivalent of two years (Abadzi, 2017).

Similarly, a comparison between 2018 PISA scores of students in English-medium and Arabic-medium schools in the United Arab Emirates (UAE) reveals stark in-country differences. While there is a gap of approximately 50 points for Math and Science, the difference in reading scores between English and Arabic-speaking test takers is close to 100 points. With 40 points on average representing one school year, this difference reveals a significant discrepancy in reading proficiency (OECD, 2009). Additionally, the gender gap of girls outperforming boys is wider for Arabic readers than for English readers, with Arabic-speaking girls outperforming boys by 70 points, versus 46 points for English-speaking students.

One underlying factor impacting Arabic-speaking students' performance on these large-scale international assessments, and thus a possible explanation for their below-average performance, is the students' lack of oral reading fluency. This means that students may be unable to read and process complex text passages accurately or simply run out of time before completing the assigned tasks.

In a global study examining reading in 35 languages across elementary school students in 20 countries, researchers demonstrated that the proportion of students reaching a benchmark for reading fluency of 40 – 50 correctly identified words per minute is significantly higher in Asian countries (median 29%) than in Africa and the Middle East (median 5%) (RTI International, 2017). Similarly, country-level data reveals large reading deficiencies in Arabic-speaking countries, with only 11% of Egyptian Grade 2 students being able to read words at a speed that is considered fluent, and only 3% of Jordanian students reaching the fluency benchmark, falling behind countries like Kenya and Ethiopia (RTI International, 2017). A snapshot of zero scores paints a dire picture: around 20% of Jordanian, and up to 34% of Iraqi second graders are unable to read a single word of a grade-level paragraph (RTI International, 2017).

The need to improve the overall performance on these assessments has received widespread attention across the Arab World, and prompted policymakers to include these rankings at the core of development strategies and national agendas (UAE Government, 2017). The role of Arabic fluency for students' success, and identifying ways to improve Arabic language instruction, however, has not been explicitly addressed. This is despite a wealth of evidence demonstrating an alarming gap between Arabic-speaking students and their peers globally. Many of these difficulties begin with the unique composition of the Arabic language. This is explored in the next section.

Table 1. 2018 PISA scores at UAE schools by language of instruction

Average Scores	Math		Reading		Science	
	Male	Female	Male	Female	Male	Female
English	454	457	450	496	441	462
Arabic	389	411	352	422	384	421

Unique Properties of Arabic

There are multiple challenges to learning the Arabic-language. These include, but are not limited to, diglossia, the subsequent instruction in Modern Standard Arabic (MSA) at school, and the visual complexity of the Arabic script. These unusual challenges decrease students' ability to quickly process questions and answers within the time given (Abadzi, 2017; Asadi et al., 2017; Carroll et al., 2017).

Diglossia

Students across the Arab world view MSA as a foreign language (Eviatar, & Ibrahim, 2014), even though it is a mandatory subject and often the language of instruction at schools. MSA's vocabulary and grammar differs significantly from *ammia*, the more colloquial version of Arabic spoken at home and the majority of social settings. Each country and region in the Arabic-speaking world has multiple local and regional colloquial forms, or dialects, with different verb and noun endings, expressions, vocabulary, and pronunciation, differing significantly from MSA (Abadzi, 2017).

As Arab countries' dialects are used as the dominant mode of communication at the informal level, young students who have only been exposed to colloquial dialects find the sudden shift, when beginning school, to the formal language of MSA difficult. Currently, students are often not sufficiently exposed to MSA to make sense of its visual complexities and grammatical framework, which they are expected to know by the time they enrol in school (Abadzi, 2017).

Visual Complexity of Arabic Script

In addition to essentially learning a foreign language with unique grammar and vocabulary during their first years at school, students also find reading the Arabic script challenging. This can result in slower processing times for letters than speakers of other languages. Lessons from developmental psychology and cognitive science in fact highlight key memory functions and visual complexities of the Arabic script that limit its accessibility and retention for reading comprehension (Abadzi, 2017; Abadzi, & Martelli, 2014; Perfetti, 2007; Peterson, & Peterson, 1959).

In addition to 29 letters and eight diacritics, some letters can have up to four different shapes depending on their position within the word (see Appendix A). Drawn in an isolated form when written alone, each letter is drawn in up to three other forms when it is connected to other letters. Additionally, Arabic letters' shape can change dramatically in different fonts.

Another visual challenge is the omission of the short vowel indicators from the written script, which typically starts in the third and fourth grades. While expert readers read faster without vowels, which are predictable (Abadzi, 2017; Taha, 2013), deleting these short vowels temporarily slows students as they spend more time trying to predict likely forms (Abu-Rabia, 2001). Most Arab countries print the TIMSS and PIRLS tests without short vowels, despite the fact that third and fourth graders may still be learning how to process unvoweled text (Asadi et al., 2017). Slow and inaccurate reading overloads working memory capacity and thus may negatively affect responses to test items.

Methods of Arabic Instruction: Challenges for Learners

Before education was formalized across the Gulf Cooperation Council (GCC), Arabic was mainly taught by religious scholars who relied on recitation, memorization of Quranic verses, and oral techniques (Nasser, 2017). While teacher-centered practices like this laid the foundation for Arabic instruction, current research has demonstrated the shortcomings of this approach for childhood literacy, which leaves many children disengaged (Selim, 2018).

With the emergence of oil, and the formation of states, formal education was introduced across the GCC in the mid-20th century. Despite the formation of national government entities and ministries of education, the curricula and teaching, especially for Arabic, were still heavily influenced by other Middle Eastern countries. This includes the importing of the labor force and text books used for teaching (Farah, & Ridge, 2009), which rendered Arabic language instruction inflexible, and difficult to adapt to new ways of teaching.

Letter Order

Until the late fifth centuries CE, Arabic remained a spoken language that was rarely written down. On the rare occasions that it was written, the script of a regional language was used, such as Nabataean, or Aramaic (Encyclopædia Britannica, 2020). The original *abjad* order of the Arabic script thus closely resembled these ancient languages.

With the advent of Islam, and the widespread teaching of Qur'an in Arabic, new letters were added to the original 22 letters of the script to accommodate the 28 phonetic sounds of Arabic. Vowelling and diacritics, including *tanween*, were also added to the script in order to allow readers of the Qur'an to recite Arabic correctly (Abbott, 1939). By the first half of the 9th century, the abjad order had been widely replaced with the *hija'i* order, which remains most frequently used in dictionaries, official documents, and schools across the Arab world today (Arnold, 1895). The *hija'i* order groups letters based on their similarity to each other, rather than introducing letters that do not change their shape, which are objectively easier to process. For a side-by-side overview and comparison between the two sequencing orders and the sequencing order used for the Iqra curriculum, refer to Appendix A.

Textbooks

Due to the abovementioned diglossic nature of Arabic, many students have little to no knowledge of MSA

prior to joining school. This practically foreign language adds another challenge for students across grade levels. However, rather than focusing on oral reading fluency, accuracy, and purely developing the students reading skills first, Arabic language textbooks commonly mix reading and writing tasks.

Examples taken from textbooks from the UAE and Egypt demonstrate the challenges for learners. An analysis of Egyptian early-grade textbooks found a large number of complex vocabulary, with up to six syllables, many of which were used only once, as well as concepts unrelated to the life experiences of Grade 1 pupils, and words introduced in isolation (Gove et al., 2013). Similarly, textbooks in the UAE introduce letters in traditional alphabetical order using real words; this, however, means that letters that are still foreign to students are mixed in with the early letters in the process. The textbooks therefore do not reflect the complexities of the Arabic script. Best practices based on evidence from cognitive science about the relationship between key memory functions and reading should be taken into consideration instead.

Teaching Staff

While MSA is the language of textbooks and instruction, the use of formal Arabic in the classroom marks a challenge not only for students, but teachers alike. Often teachers who may not feel prepared or comfortable delivering their classes in MSA fall back into using their home country dialect (Al-Huri, 2012). Since many teachers of the Arabic language in Gulf countries like the UAE are Arab expatriates,

Table 2. Comparison of Iqra learning materials and UAE Ministry of Education learning materials

Key Differences	UAE Ministry of Education Grade 1 Arabic Curriculum	Iqra Curriculum	Details
Language Taught	MSA	MSA	Iqra contains some made up combinations of letters used as tongue twisters to encourage and practice fast reading
Letter Order	Alphabetical	Based on Simplicity	Iqra starts with letters that have fewer and simpler shapes
Words Taught	Full words with multiple syllables	Varies according to letters	Ministry of Education textbook presents letters that have not yet been taught. The Iqra textbook gradually introduces words based on letters taught, increasing as more letters are taught. Iqra also starts presenting full simple sentences accordingly.
Use of Pictures	✓	✗	As Iqra focuses on speeding up reading, pictures can be a distraction. Only one picture is used at the beginning of the lesson to help students guess the letter.
Font Size	Normal (about 18)	Varies (reaching up to 60)	Iqra aims to train students to read quickly in different font sizes. Large sizes help young kids recognize the letters more.
Short Vowels and *Tanween*	All at once	Gradually	Iqra gradually introduces short vowels and *Tanween*

this aspect further impedes students' quick mastery of MSA by introducing new words from other Arabic dialects.

There is also a common belief throughout the Arabic-speaking world that MSA is too difficult for children and, since it is not practically useful, they should not be exposed to it before Grade 1, except for limited exposure through memorization of Quranic text (Ayari, 1996). Research, however, reveals that children exposed to MSA early on have better reading comprehension than those children exposed only to spoken Arabic (Abu-Rabia & Taha, 2005). While some students may be exposed to more MSA content through their home environment and parental involvement, this may further reinforce gaps in reading comprehension along socioeconomic status.

Iqra Program Design

As the first step towards a larger, comprehensive rethinking of teaching Arabic early grade literacy, the Iqra program takes into consideration the aforementioned unique properties of Arabic. The program modifies the methods and resources used for teaching early-grade Arabic reading in key areas as described below.

Textbook and Letter Order

The Iqra curriculum and its underlying textbook are based on simple and effective techniques informed by evidence from cognitive science. Research suggests that in order for students to process texts more quickly, instruction should first maximize the practice of individual letters and words by repeated practice, until this process becomes automatic (Dehaene & Cohen, 2011; Saiegh-Haddad & Joshi, 2014). This enables students to read faster, recall important information, have time to think critically, and eventually score higher on assessments and tests.

Most notably, the Iqra textbook introduces Arabic letters in scaffolded letter order, starting with the letters that are visually easier to process, progressing in difficulty, and refraining from teaching letters through the use of complex, multi-syllable words unfamiliar to the students. The textbook begins with letters that do not change their shape depending on the position in the word, و، ر، ز etc., before progressing to letters that change their shapes and are therefore more difficult to visually process for learners.

In contrast to standard Arabic textbooks for early grades, the Iqra textbook has a simple, functional design that features big, easy-to-read letters, adequate spacing of letters, and few pictures to avoid distraction. Additionally, students learn to read each letter with a combination of short voweling so that letter recognition becomes an automatic process, allowing students to combine individual letters into whole words as fast as possible.

Instructors are able to teach the Iqra curriculum with minimal training and require only a few resources, such as the textbook and a board or projector. After a warm-up and review of previous letters, each lesson introduces and practices a new letter. The lesson continues with exercises combining the new letter with previously taught letters. Children are then asked to read independently after the day's lesson is shown on the classroom multimedia projectors or boards. The teacher passes by each student, gives brief feedback, and encourages everyone to stay on task and keep reading.

Over the course of the academic year, researchers monitored the students' progress by conducting classroom visits and collecting data. The following section introduces the Iqra pilot study design, as well as its findings, before discussing the results and the implications of the program for reading fluency.

The Pilot

The findings presented below are based on a pilot program conducted at four government primary schools in the city of Ras Al Khaimah during the 2018-2019 academic year. Each school participated with two intervention and two control classrooms, adding up to a total of approximately 350 students.

Student progress was measured at the beginning, middle, and end of the school year, using a modified version of an Early Grade Reading Assessment (EGRA) tool that evaluates Arabic-language fluency of native Arabic speaking children, previously used in Jordan (RTI International, 2016). Iqra lessons were taught by a school staff member twice a week for 45 minutes over the full academic year. Iqra lessons were taught within the framework of the government school system as a supplemental lesson during a period originally reserved for extracurricular activities. This design allowed for an intervention group of students to receive the additional Iqra Arabic lessons while a control group of students only received regular Arabic lessons.

Results

Looking at the total number of letters and words correctly identified, students in the intervention and control group scored similarly on the pre-test. Both groups were able to identify nearly the same number of letters and read the same number of words, with the difference between the groups not being statistically significant, as shown in Table B1 in the Appendix.

Starting at the mid-year assessment, however, the intervention group's scores were significantly higher than the control group's scores on both letter identification and word reading assessments. Students in the intervention group correctly identified 52.8 letters, while the control group only identified 39.3 letters per minute. On the word reading scores, the intervention group was able to correctly read 16.7 words compared to the control group that could read 12 words per minute.

This trend continued to the end-of-year assessment, in which the intervention group scored significantly

higher on correct letters identified and words read than the control group, as shown in Table B1. Out of a text consisting of 49 words, students in the intervention group correctly identified around 29 words, while the control group identified approximately 20 words - a relative improvement of 44%.

Furthermore, findings summarized in Table B2 demonstrate that the intervention group attempted to identify significantly more letters and made fewer errors than the control group. On the word reading assessment, the intervention group therefore shows a higher percentage of words read correctly[1], indicating the students in the Iqra classrooms could read words correctly with 91.5 percent accuracy. As more accurate readers are able to decode and interpret the words of a text with greater automaticity, increased accuracy is related to students' increased understanding and interpretation of more complex texts.

While both intervention and control groups show great improvement, students using the Iqra curriculum made significantly greater improvement than other students, as demonstrated in Figures 1 and 2.

The assessment finds further evidence for an improvement in students' reading accuracy. As shown in Table 3, the percentage of students who did not make any errors in

Figure 1. Letter pre-test and post-test mean scores of intervention and control groups

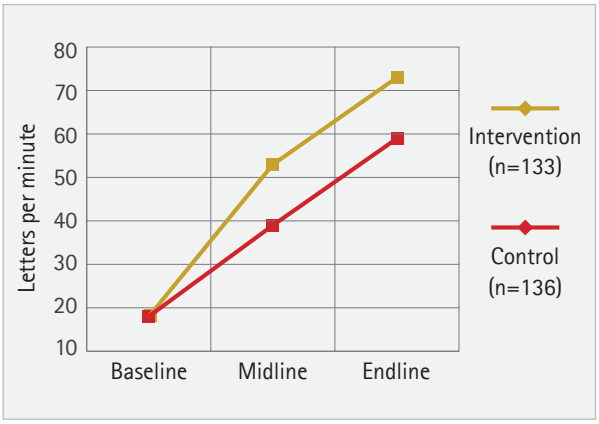


Figure 2. Word pre-test and post-test mean scores of the pilot two intervention and control group

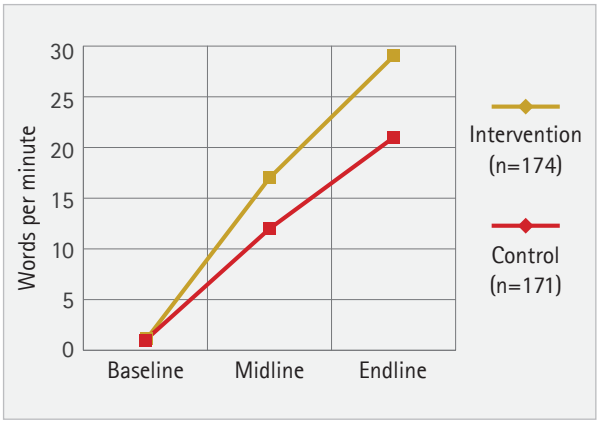


Table 3. Frequency distribution of the number of errors made per minute on the post-tests

Number of Errors	Letters				Words			
	Intervention (n=133)		Control (n=136)		Intervention (n=174)		Control (n=171)	
	n	%	n	%	n	%	n	%
0	69	51.9	57	41.9	76	43.7	54	31.6
1	25	18.8	18	13.2	26	14.9	28	16.4
2	12	9.0	11	8.1	24	13.8	25	14.6
3	9	6.8	13	9.6	19	10.9	16	9.4
4	7	5.3	5	3.7	8	4.6	12	7
5	11	8.3	32	23.5	21	12.1	36	21.1

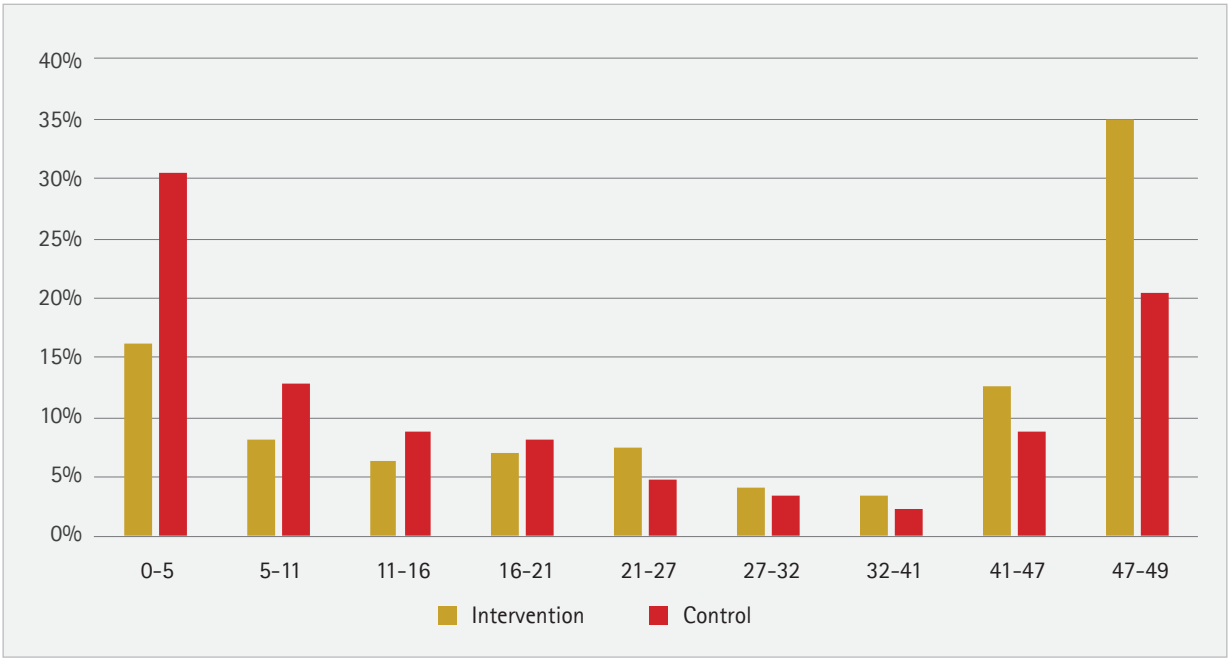
[1] The percentage of correct letters was estimated by dividing the total number of errors made by the total number of letters attempted and then subtracting the obtained value of each group from one.

one one minute was higher in the intervention group than in the control group (51.9% vs. 41.9% for letter identification and 43.7% vs. 31.6% for word reading). In contrast, the proportion of students who made the maximum of five errors allowed during the assessment was lower in the intervention group than in the control group (8.3% vs. 23.5% for letters and 12.1% vs. 21.1% for words).

Interestingly, a look at the students at the lowest end of the score range shows that students using the Iqra curriculum also made more progress than their peers in regular Arabic classes. When we compare the post-test word reading scores of students who were previously unable to read a single word, we find that students who participated in Iqra were now able to read an average of 11.4 more words correctly than those in the control group (29 words for Iqra vs. 17.6 words for the control group). This group difference was statistically significant (t_{298} = 5.21, $p < .001$), and its effect size was moderate (Cohen's d = 0.60).

Figure 3 displays the percentage frequency distribution of the total number of words students read correctly until they made five errors. The share of students who made no progress and scored zero in the post-test was less than half in the intervention group (8% of students) compared to the control group (16% of students). Overall, the proportion of students at the low end of the distribution was greater in the control group, while that of students at the higher end was larger in the intervention group, further illustrating that students participating in the Iqra program made faster and larger improvements than their peers in regular Arabic classes.

Figure 3. Distribution of words read correctly in the intervention and control group



Gender and Socioeconomic Status

An encouraging finding from the pilot showed no statistically significant difference between male and female students' scores. In light of a widening reverse gender gap in several regions in the world, (Ridge, Kippels & Chung, 2017; OECD, 2015), monitoring this first cohort of Grade 1 and other students in similar programs can help generate data and provide insight into where and when the gender gap arises, and how targeted interventions can mitigate its effects.

Socioeconomic status is also a potentially important predictor of student achievement, as students from low-income families, particularly males, tend to do worse than their peers (Ridge, Kippels & Chung, 2017; OECD, 2015). The pronounced positive effect of Iqra in boosting low-performing students shows that such programs could be strategically utilized as early-grade preventive support measures or interventions to improve reading comprehension.

Limitations and Challenges

Overall, the program delivers promising results, showing greater improvements in Arabic reading fluency compared to students in the control group. At the endline of the pilot, the reading scores of students in intervention groups were comparable or higher than Grade 2 students' scores in countries like Morocco, Egypt, or Jordan, who were on average correctly reading between six to 16 words per minute (RTI, 2013). However, in a global comparison, the scores of the Iqra program were still low, since for increased comprehension, students should be reading closer to 40 correct words per minute (Abadzi, 2011).

Despite delivering promising results over a short amount

of time, Iqra and its evaluation are still in their infancy. Until the research has been replicated in more classrooms, the relatively small sample size should caution researchers and readers to make inferences about the general population of Arabic primary school students. Additional variables, such as the regular Arabic language curriculum and outside exposure to MSA, as well as measures of socioeconomic status should be controlled for in the future to demonstrate the effects on the students' Arabic reading fluency more reliably.

Due to the schools' voluntary participation in Iqra, students in intervention classrooms did not have Iqra in place of their regular Arabic classes, but in addition to their regular Arabic classes. This study design makes it difficult to differentiate between an Iqra effect versus a simple extra-lesson effect, meaning we cannot say with certainty how effective regular additional Arabic instruction would be vis-a-vis Iqra.

Time on task is another aspect that needs better measurement. Although observers informally noted instructors' use of the textbook, student engagement, and distractions that inhibited reading time, the specific amount of time students focused was not tracked. In general, first graders have short attention spans and unsurprisingly, students in this pilot often got distracted.

Recommendations

Develop Closer Partnerships with Local Schools and Ministries

The creation and implementation of the Iqra program followed a very collaborative and iterative process, which relied on one hand on the strong institutional support for education research, and on the other hand on the commitment and support of volunteers and individuals who trialed resources and provided many hours of feedback. Enabled by the Al Qasimi Foundation's extensive experience partnering with the UAE Ministry of Education, local instructors, and schools, it has highlighted the important need for multi-stakeholder buy-in. This is particularly true for school principals, whose support is needed to implement the program and to allow the assessments and observations. Instructors also demonstrated engagement by discussing results, issues, and concerns after assessments.

The scaling-up of Iqra and other similar initiatives throughout the region would also benefit from greater curricular alignment with local ministries of education in terms of curriculum to reinforce literacy teaching. Discussions around the interaction of the Iqra curriculum with the national curriculum, particularly around issues like phonetics scaffolding or letter order introduction need to be embedded in a broad coalition inclusive of educators and policymakers supporting future evidence-based reforms.

Expand Pilot to More Schools and Areas

Based on the encouraging results of this pilot, the Iqra reading textbook was expanded to a total of seven schools during the 2019-2020 academic year, including Arabic learners at a private, English-medium school. At this point in time, more pilots are needed across schools, but importantly, across different Arabic-speaking countries, in order to generate a substantive body of data that can validate the findings of this pilot.

Previous research on creating literacy benchmarks has found that sample sizes smaller than 200 generally produce unreliable results (RTI International, 2017). This means that the key to a reliable evaluation of the program is to boost sample size and trial the curriculum in a diverse array of geographical and cultural settings across the Arab world. Additionally, replicating research that looks at early grade Arabic literacy can jumpstart the conversation around best practices and further underscore the effectiveness of the Iqra curriculum.

Include Measures of Parental Involvement, Socioeconomic Status, and Home Environment

As potentially important predictors of student achievement, future program evaluations should consider the impact of students' individual circumstances related to socioeconomic status and parental involvement. Furthermore, such evaluations should monitor how both factors may affect students' exposure to MSA and engagement with the material. At present, very little is known about factors that contribute to student success beyond the classroom. Including questionnaires or other measurements of factors like household size, income, parents' level of education, to name only a few, can be useful for assessing the the impact of the Iqra program and isolating potentially confounding factors.

Develop Guidelines for Teachers and Increase Student Time-on-Task

In addition to the Iqra curriculum, a teacher guide was created at the end of the 2019/2020 school year and will be made available for the next academic year. This will provide teachers with detailed instruction and lesson guides to further ease the scaling up of the program. It will also assist teachers in adopting the new curriculum and ensure consistent quality of instruction.

Future pilot study designs will include weekly classroom visits, and utilize an observation form with a simple tool for measuring time-on-task, based on the Stallings classroom observation system, to capture variations of student reading time in between classrooms (World Bank, 2015; Abadzi, 2007). Iqra resources can additionally explore better ways to keep students' attention on reading. For example, providing instructors with exercises that have children stand up, stretch, and sit down at intervals during

class or shortening the length of lessons and having more than two lessons per week in order to increase time on task. More sophisticated technology, such as eye tracking devices can be employed to gauge student engagement in future studies (Jankovski & Schofield, 2017).

Investigate Implications for Special Education & Struggling Students

Across schools, observers worked with instructors to re-engage low performing and special needs students in the classrooms. In one school, Foundation staff conducting observations worked individually with special needs students. The Iqra curriculum can be implemented at both a group level and in a one-on-one context with struggling readers with the help of a classroom assistant or parent volunteer who could also engage students with home practice.

Also, Iqra assessments could help schools to identify students who rank higher or lower than their peers. The periodic assessment of students incorporated in the Iqra curriculum can help instructors recognize students in need of remedial attention, and also monitor the progress of special needs students. Early interventions for students with reading problems may help them keep pace with their peers and mitigate challenges as the level of difficulty increases.

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Appendix A

Table A1: *Abjadi* sequence

Name	Isolated	Initial	Middle	Final
Alif	ا	ا	ـا	ـا
Ba'	ب	بـ	ـبـ	ـب
Jeem	ج	جـ	ـجـ	ـج
Dal	د	د	ـد	ـد
Ha'	ه	هـ	ـهـ	ـه
Waw	و	و	ـو	ـو
Zai	ز	ز	ـز	ـز
H'a'	ح	حـ	ـحـ	ـح
Tta'	ط	طـ	ـطـ	ـط
Ya'	ي	يـ	ـيـ	ـي
Kaf	ك	كـ	ـكـ	ـك
Lam	ل	لـ	ـلـ	ـل
Meem	م	مـ	ـمـ	ـم
Noon	ن	نـ	ـنـ	ـن
Seen	س	سـ	ـسـ	ـس
A'in	ع	عـ	ـعـ	ـع
Fa'	ف	فـ	ـفـ	ـف
Sad	ص	صـ	ـصـ	ـص
Qaf	ق	قـ	ـقـ	ـق
Rai	ر	ر	ـر	ـر
Sheen	ش	شـ	ـشـ	ـش
Ta'	ت	تـ	ـتـ	ـت
Tha'	ث	ثـ	ـثـ	ـث
Kha'	خ	خـ	ـخـ	ـخ
Thal	ذ	ذ	ـذ	ـذ
Dhad	ض	ضـ	ـضـ	ـض
Dha'	ظ	ظـ	ـظـ	ـظ
Ghain	غ	غـ	ـغـ	ـغ

Table A2: *Hija'i* sequence

Name	Isolated	Initial	Middle	Final
Alif	ا	ا	ـا	ـا
Ba'	ب	بـ	ـبـ	ـب
Ta'	ت	تـ	ـتـ	ـت
Tha'	ث	ثـ	ـثـ	ـث
Jeem	ج	جـ	ـجـ	ـج
H'a'	ح	حـ	ـحـ	ـح
Kha'	خ	خـ	ـخـ	ـخ
Dal	د	د	ـد	ـد
Thal	ذ	ذ	ـذ	ـذ
Rai	ر	ر	ـر	ـر
Zai	ز	ز	ـز	ـز
Seen	س	سـ	ـسـ	ـس
Sheen	ش	شـ	ـشـ	ـش
Sad	ص	صـ	ـصـ	ـص
Dhad	ض	ضـ	ـضـ	ـض
Tta'	ط	طـ	ـطـ	ـط
Dha'	ظ	ظـ	ـظـ	ـظ
A'in	ع	عـ	ـعـ	ـع
Ghain	غ	غـ	ـغـ	ـغ
Fa'	ف	فـ	ـفـ	ـف
Qaf	ق	قـ	ـقـ	ـق
Kaf	ك	كـ	ـكـ	ـك
Lam	ل	لـ	ـلـ	ـل
Meem	م	مـ	ـمـ	ـم
Noon	ن	نـ	ـنـ	ـن
Ha'	ه	هـ	ـهـ	ـه
Waw	و	و	ـو	ـو
Ya'	ي	يـ	ـيـ	ـي

Table A3: Iqra sequence

Name	Isolated	Initial	Middle	Final
Waw	و	و	ـو	ـو
Zai	ز	ز	ـز	ـز
Rai	ر	ر	ـر	ـر
Dal	د	د	ـد	ـد
Thal	ذ	ذ	ـذ	ـذ
Alif	ا	ا	ـا	ـا
Lam	ل	لـ	ـلـ	ـل
Meem	م	مـ	ـمـ	ـم
Ya'	ي	يـ	ـيـ	ـي
Ta'	ت	تـ	ـتـ	ـت
Noon	ن	نـ	ـنـ	ـن
Tha'	ث	ثـ	ـثـ	ـث
Ba'	ب	بـ	ـبـ	ـب
A'in	ع	عـ	ـعـ	ـع
Ghain	غ	غـ	ـغـ	ـغ
Ha'	ه	هـ	ـهـ	ـه
Fa'	ف	فـ	ـفـ	ـف
Qaf	ق	قـ	ـقـ	ـق
Kaf	ك	كـ	ـكـ	ـك
H'a'	ح	حـ	ـحـ	ـح
Jeem	ج	جـ	ـجـ	ـج
Kha'	خ	خـ	ـخـ	ـخ
Seen	س	سـ	ـسـ	ـس
Sheen	ش	شـ	ـشـ	ـش
Sad	ص	صـ	ـصـ	ـص
Dhad	ض	ضـ	ـضـ	ـض
Tta'	ط	طـ	ـطـ	ـط
Dha'	ظ	ظـ	ـظـ	ـظ

Appendix B

Table B1. Pre-test and post-test mean scores on letter and word identification

Time	Letters					Words				
	Intervention (n=133)		Control (n=136)			Intervention (n=174)		Control (n=171)		
	M	SD	M	SD	*t (267)*	M	SD	M	SD	*t (343)*
Pre-test	16.7	26.7	17.7	29.8	-0.29	1.1	5.17	1.1	3.15	-0.09
Mid-test	52.8	39.6	39.3	38.9	2.83**	16.7	17.45	12	17.3	2.49*
Post-test	74.2	36.6	59.3	41.9	3.09**	29.6	19.03	20.6	19.2	4.39***
Difference (post-test – pre-test)	57.5	41.4	41.6	43.4	3.06**	28.5	19.20	19.4	18.7	4.44***

* p < .05, ** p < .01, ***p < .001

Table B2. Post-test mean numbers of letters and words attempted and errors made

Number	Letters					Words				
	Intervention (n=133)		Control (n=136)			Intervention (n=174)		Control (n=171)		
	M	SD	M	SD	*t (267)*	M	SD	M	SD	*t (343)*
Total Attempts	76.29	35.07	62.10	40.33	3.08**	32.31	18.04	23.78	18.49	4.34***
Errors	2.12	2.10	2.76	2.24	-2.43*	2.75	2.19	3.23	2.12	-2.10*

* p < .05, ** p < .01, ***p < .001

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