DETERMINANTS OF STUDENT ACHIEVEMENT ON PISA 2018:
THE CASE OF JORDAN'S PUBLIC SCHOOL STUDENTS

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CONTENTS

EXECUTIVE SUMMARY

Jordan's students have been consistently underperforming in reading literacy, with many not even reaching minimum proficiency levels on international assessments. Researchers have been widely interested in what factors determine student achievement to advance student learning. The literature identifies a number of factors including but not limited to students' socioeconomic background, pre-school attendance, levels of parental support and growth mindset.

This paper, drafted to inform the development of Jordan's National Literacy Strategy, explores the determinants of students' reading literacy achievement from the Organization for Economic Cooperation and Development's (OECD) Program for International Student Assessment (PISA) for the year 2018, to identify possible policy and programmatic interventions. In line with literature exploring similar research questions, this was conducted using regression analysis, including four categories of predictor variables; 1. Student and home characteristics, 2. Students' beliefs and abilities and 3. Classroom-based practices and 4. School-level factors. Key findings and recommendations of the analysis are highlighted below.

23% of the variation in students' reading achievement is attributable to student and home background characteristics.

1. **Gender was one of the strongest predictors of student achievement,** with females outperforming their male counterparts by 22 points. Further analysis revealed that **part of** the **gap** is **attributable** to students' **metacognitive skills** in summarizing texts,[1] their **self-concept** of reading difficulty, their **motivation** to master tasks and **joy of reading**.[2] Policies and interventions targeting males should focus efforts on improving the aforementioned variables.

2. **Grade repetition was a strong negative predictor of achievement**, with students who reported repeating a grade scoring 31 points below their peers who did not repeat. It would be beneficial to consider options to mitigate the effects of poor performance, such as **replacing grade repetition** with **one-to-one** or **group tuition** with underperforming students.

3. **Attendance of pre-school was not a significant predictor of student achievement**. These findings *may* indicate students attended low quality pre-schools. **Reform efforts** in Jordan should **expand focus** on not only access, but also **quality**, to realize the benefits of this stage. It is essential to also **expand** reform efforts to **include nurseries** and **kindergarten level one**, as earlier investments yield higher returns.

1 The 2018 PISA assessed students' metacognitive abilities across specific literacy tasks, including students' ability to summarize texts. More information is available in the body of the paper.

2 A Blinder-Oaxaca decomposition analysis was conducted to better understand the gender gap in achievement. More detail on this analysis is available in the body of the paper.

4. **Expanding access to quality preschool** programs may also **support closing** the **gap** in performance between **disadvantaged** and **advantaged** students, as the analysis showed **socioeconomic status** is a **predictor** of student achievement.

5. **Parental emotional support was a positive predictor of student achievement;** with students who reported receiving more support achieving higher on reading literacy. Identifying ways to enhance parental engagement and support could therefore support in advancing students' learning.

Student beliefs and abilities altogether explained a further 10% of the variation in students' reading achievement, when controlling for student and home characteristics.[3]

6. Students' **metacognitive abilities** were significant **positive predictors** of their **reading** achievement.[4] To enhance students' metacognition, teachers should be trained on how to **explicitly instruct** on **metacognitive strategies** and to **model thinking strategies** to their students.

7. Students' **enjoyment of reading** was a **significant positive** predictor of reading scores. While the relationship is likely bidirectional, there may be benefit in **piloting** a family of **interventions** around promoting students' reading skills and positive attitudes towards reading, such as a **reading hour** in schools.

8. Having a **growth mindset** was **associated** with **19 higher points** on **reading** than a fixed mindset. **Teachers should support** students in **believing** that their **success is the product** of their **effort**, and **hold** the **belief** that **all students can learn** and become successful. **Parents** should also **ensure** to **praise** their children's **efforts** and **strategies**, **instead** of **innate abilities**.

Classroom-based practices were not significant predictors of student achievement when controlling for student and home background characteristics, in addition to student beliefs and abilities.

9. Markedly, the **length of time** 15-year old PISA-participating students reported spending **in** the Arabic language **lesson** was **not associated with learning outcomes**. Meanwhile, an association between time spent in language lessons and scores was observed in OECD countries. This may suggest that **teachers in Jordan** are **not making use of class time** or implementing **quality pedagogical practices**, which should be the focus of professional development programs and policies.

10. Students who reported that the **longest piece of text** they ever **read** for their Arabic language lesson was **at least two pages scored** nearly **10 points higher** than peers who read **one page or fewer**, highlighting a positive relationship between sustained reading and higher outcomes. This also suggests that longer reading assignments are essential for students to practice and develop their reading skills.

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3 This is the combined effect of student beliefs and abilities. They are looked at in separate categories in the body of the paper.

4 Metacognition is defined as an individual's knowledge of their cognition (Dinsmore, Alexander & Loughlin, 2008)

Dinsmore, D. L., Alexander, P. A. & Loughlin, S. M. (2008). Focusing the conceptual lens on metacognition, self-regulation and self-regulated learning. *Educational Psychology Review, 20*, 391-409.

Quantitative measures of access and quality of school-level factors or resources were not significant predictors of student achievement when controlling for student and home characteristics, student beliefs and abilities and teacher-level factors.

11. **Student to teacher ratios**, **number** of **educational staff** and **material** and the **proportion** of **teachers** who are fully **certified** were **not significant predictors** of reading scores. While this data could suggest that school resources do not contribute to student learning, an alternative explanation is that there is **not enough variety** in terms of the **quality** and **nature** of **resources** within schools. This means that differences in student achievement based on resources were not detectable using the existing data. Until further data are available, it may be more **essential** to **focus reform efforts** on **teacher professional development** in **managing larger class sizes** or using **existing resources** more **effectively**.

It is evident that what is required to advance students' literacy learning is a system-wide approach, targeting teachers, schools, ministries, and importantly, parents who are part and parcel of shaping students' learning.

At the heart of many of the reform efforts highlighted in this paper are teachers; focusing on the effectiveness of teachers and teaching practices is imperative to advance student learning. Clear intervention areas were also highlighted, such as improving teachers' explicit instruction in meta-cognition, training teachers on developing students' growth mindsets and motivation for reading and engaging with parents to implement positive practices at home.

Indeed, encouraging parents to support their children emotionally can be key to developing children's self-esteem and learning. Raising awareness among parents on how to develop their children's growth mindsets and self-efficacy may also be key to improving student learning.

At the system level, it would be integral to invest in the quality of pre-school settings, replace grade repetition with one-to-one or group tuition, and implement interventions that combine enjoyment of reading, sufficient reading time and support, in addition to reading instruction to foster a love for reading and hone literacy skills. Such interventions must also be coupled with teacher training on ways to make reading enjoyable and how to integrate reading during the school day, in addition to provision of texts with differing topics and levels of difficulty to suit different reading abilities and interests.

Finally, it is important to note that while the PISA data examines 15-year-old students, many of the student behaviors, perceptions and skills observed are an accumulation of students' past knowledge and experiences. Therefore, conclusions drawn from this paper should have implications for the wider school system, and should not be limited to 15-year-old students and their teachers. For example, fostering a love of reading should be embedded in students' education as early as possible, as well as increasing teaching and learning lesson time for all students.

BACKGROUND

Functional reading literacy is an essential prerequisite for individuals to become successful in school and life (Kirsch et al., 2002),[5] and participate effectively in society (OECD, 2019).[6] The state of reading literacy among students in Jordan needs immediate attention. The World Bank (2019) estimated that 52% of Jordan's students are in learning poverty, which means they cannot read and understand a simple short text by age 10.[7] These findings are paralleled among older students. Two in every five 15 year-old students did not meet the minimum proficiency levels for reading on the Programme for International Student Assessment (PISA) in 2018. This means 40% of students did not have competencies that will allow them to participate effectively in life. Additionally, virtually no student in Jordan reached the highest levels of proficiency in reading (Ghawi & Dahdah, 2020).[8] The situation is even more dire for Jordan's male students. Jordan has one of the largest gender achievement gaps among all PISA participating countries, with girls outperforming their male counterparts in reading by an average of 51 points, which is equivalent to more than one year of schooling (Ghawi & Dahdah, 2020).[9] [10] The World Bank (2019) also showed that learning poverty rates were higher amongst boys than girls.[11]

Researchers have been widely interested in what factors determine student achievement to advance student learning, and a number of factors have been identified (Barber and Mourshed, 2007; Hattie, 2009).[12] These include, but are not limited to, students' socioeconomic background, pre-school attendance, their metacognitive abilities, levels of parental support and their growth mindset. There is a need to identify what factors are influencing students' underachievement in the Jordanian context, in order to explore ways to tackle it and ground decisions in evidence. PISA offers a rich dataset to do so, especially considering the assessment focused on reading literacy in its latest 2018 cycle, and offers a wealth of data about students and their schools.[13] As such, this paper aims to uncover the main determinants of Jordan's public school students' reading achievement, using the PISA 2018 data.

5 Kirsch, I., De Jong, J., Lafontaine, D., McQueen, J., Mendelovits, J., & Monseur, C. (2002). Reading for change. Performance and engagement across countries. Results from PISA 2000. Retrieved from: https://www.oecd.org/education/school/programmeforinternationalstudentassessmentpisa/33690904.pdf

6 OECD. (2019). PISA 2018: Insights and Interpretations. Retrieved from: https://www.oecd.org/pisa/PISA%202018%20Insights%20and%20Interpretations%20FINAL%20PDF.pdf

7 World Bank, EduAnalytics. (2019). Jordan: Learning Poverty Brief. Retrieved from: https://thedocs.worldbank.org/en/doc/457891571223499927-0090022019/original/MNAMNC02JORLPBRIEF.pdf

8 Ghawi, G., Dahdah, S. (2020). PISA 2018: Exploring Jordan's performance. Queen Rania Foundation. Retrieved from: https://www.qrf.org/sites/default/files/2020-10/pisa_2018_exploring_jordans_performance_in_the_2018_cycle_-_qrf.pdf

9 Ibid.

10 The national gender gap was 51-points, while the gap in public schools was 55 points in favor of female students. This is without controlling for any other variables. For the rest of the brief, other variables are controlled for

11 World Bank, EduAnalytics (2019). Jordan: Learning Poverty Brief. Retrieved from: https://thedocs.worldbank.org/en/doc/457891571223499927-0090022019/original/MNAMNC02JORLPBRIEF.pdf

12 Barber, M. and Mourshed, M. (2007) How the world's best-performing school systems come out on top. London: McKinsey & Company. Available at: https://www.mckinsey.com/industries/public-and-social-sector/our-insights/how-the-worlds-best-performing-school-systems-come-out-on-top (Accessed: 15 September 2021).; Hattie, J. (2009) Visible teaching–visible learning: A synthesis of 800 meta-analyses on achievement. Abingdon, Oxon, UK: Routledge.

13 PISA assess math, reading and science literacy every 3 years, but focuses on one of the domains to a larger extent each cycle.

THIS PAPER

This paper was developed as part of the deliverables submitted to Jordan's National Literacy Strategy Task Force, to assess the system's capacity to deliver literacy learning outcomes. It builds off two previous analyses[14] [15] conducted by QRF on the 2018 PISA data. The first two papers looked at student scores, and how they varied based on school and student attributes, in addition to the reading environment Jordan's students are in. The analysis conducted in the first two papers was descriptive and granular in nature, and no inferences as to the determinants of student achievement could be made. Meanwhile, this paper aims to explore the determinants of student achievement in reading, with the aim of informing policy and programmatic interventions to improve students' reading literacy.

The main question addressed by this paper is the following:

What factors are associated with reading performance across 15-year old students in Jordan's public schools?

In line with existing literature on determinants of student achievement, variables were categorized into groups around four main areas: student and home characteristics; student knowledge and beliefs; classroom-based practices and school-level characteristics.

14 Ghawi, G., Dahdah, S. (2020). PISA 2018: Exploring Jordan's performance. Queen Rania Foundation.

15 Al-Atari, S., Ghawi, G. (2022). PISA 2018: Exploring The Attitudes and Practices of Jordan's Students and Schools Towards Reading. Queen Rania Foundation.

METHODS

In order to address the research question, an ordinary-least squares regression was run with the aggregate plausible reading score as the outcome variable,[16] and 23 predictor variables. The predictor variables were chosen based on a review of the literature that highlighted which factors typically relate to student achievement in reading and student achievement more generally. Additionally, variables that were considered policy levers for decision makers to improve reading literacy among Jordan's students were included in the analysis. A summary of the predictor variables used is outlined in Table 1. These variables were drawn from the student and principal questionnaires from the 2018 PISA round.

TABLE 1: THE PREDICTOR VARIABLES USED IN THE REGRESSION MODEL TO EXPLORE THEIR INFLUENCE ON READING SCORES, BY CATEGORY OF VARIABLE.[17]

Category	Variable/category of variables[18]
Student and home background characteristics	Student gender
	Student immigration status
	Students' socio-economic status
	Grade repetition
	Students' perceptions of parental support
	Pre-school attendance
Students' meta-cognitive abilities – reading specific	Meta cognition for understanding and remembering texts
	Meta cognition for summarizing texts
Perceptions towards reading and reading abilities	Enjoyment of reading
	Self-concept of reading difficulty
	Self-concept of reading comprehension

16 The aggregate plausible reading score combines 10 plausible value scores of reading on the PISA. More information on plausible values can be found here.

17 Explanations of these variables are available in Appendix A.

18 Many of the variables are indices constructed by the OECD, which are either composed of several items from the questionnaires, or constructed through specific arithmetic transformations on one variable. This link provides more information on some of the indices and their construction. Appendix A summarizes the indices.

Students' general perceptions towards studying	Self-efficacy
	Students' learning goals
	Motivation to master tasks
	Growth mindset
Classroom-based practices	Longest number of pages ever read for Arabic lesson
	Teachers' adaptive instruction
	Students' perception of teacher support
	Length of Arabic language lesson
School-level factors	Shortage of educational staff
	Shortage in educational materials
	Proportion of fully certified teachers
	Student to teacher ratios

One overall regression specification was identified, including all variables outlined in Table 1. Each group of variables outlined in the first column of Table 1 were entered one at a time, to examine the effects of each category of variables on reading outcomes. Additionally, a Blinder-Oaxaca decomposition analysis was conducted to further examine the gender gap in learning.[19] Considering female students in Jordan consistently outperform their male counterparts in international assessments, this approach was adopted to better understand the factors are influencing the gender gap.

19 The Blinder-Oaxaca Decomposition analysis is typically used to explore differences in mean outcomes across groups, using linear regression models and counterfactuals. It helps identify what part of the difference is explained by specific variables accounted for in the model, and what part is left unexplained by the model (Jann, 2008).

LIMITATIONS OF THE **ANALYSIS OR DATA**

While PISA offers a rich dataset that allows for the exploration of student achievement revealing many policy and programmatic insights, there are some limitations associated with it. Firstly, it is essential to note that several variables are based on student or principal perceptions and self-reports. As such, they may not be fully reflective of the reality on the ground. For example, the adaptive teaching instruction variable is based on students' perceptions, which may be difficult for a 15-year old student to identify and accurately report on, despite the questions being asked in a simplified, descriptive way.

Ambiguity in interpreting some of the data also presented a limitation, as is the case with the pre-school attendance variable. This question asks students about their age when they first entered pre-school. The data however, does not indicate the actual time spent in pre-school, as students may not have attended continuously.

Other issues with social desirability or question comprehension may cause bias. One such issue is with the question on the number of books at home. A previous analysis showed that students with more books at home had higher average scores. However, those who reported having 500 books or more at home, scored the lowest when compared to their counterparts.[20] This result may be due to social desirability bias, or difficulties in estimating the number of books at home.

Additionally, there are some variables that have either not been measured or cannot be measured - as not all concepts are measurable. In terms of variables that have not been measured for example, there is no variable in PISA around students' foundational skills or their stock of knowledge, which could explain student achievement at 15 years of age. Researchers also suggest that since innate ability or previous academic performance are not measured on PISA, it is not possible to control for their effects on test scores (Dincer & Uysal, 2010).[21]

Finally, it is essential to note that this data was collected before COVID-19. Challenges with students' learning have been further compounded by the pandemic and new issues impeding students' learning have surfaced, which are not fully reflected in this dataset or analysis.

20 Ghawi, G., Dahdah, S. (2020). PISA 2018: Exploring Jordan's performance. Queen Rania Foundation. Retrieved from: https://www.qrf.org/sites/default/files/2020-10/pisa_2018_exploring_jordans_performance_in_the_2018_cycle_-_qrf.pdf

21 Dincer, M. A., & Uysal, G. (2010). The determinants of student achievement in Turkey. *International Journal of Educational Development, 30*(6), 592–598. Retrieved from: https://doi.org/10.1016/j.ijedudev.2010.05.005

FINDINGS

Student and home background characteristics explained 23% of the variance in student reading.

Controlling for all different groups of variables, gender was one of the strongest predictors of reading achievement, with female students scoring 22 points higher than their male peers, which is equivalent to half a year of schooling (Table 2).

This gap is evidenced across many countries worldwide, with several theories attempting to explain it. Some theories suggest the cause is socio-cultural, with schools and families reinforcing reading behaviors among females, rather than males. Indeed, PISA data show that female students in Jordan tend to value reading to a greater extent and were more likely to read for pleasure when compared to their male peers (Al-Atari & Ghawi, 2022).[22]

The Blinder-Oaxaca decomposition analysis was run to better understand what may drive the gender gap in achievement.[23] The analysis revealed that the overall gender achievement gap was 37 points (significant at $p<.001$),[24] around 13 points of which can be contributed to the differences in predictor variables between male and female students ($p<.001$). In other words, if male students had the same background- and school-level characteristics, in addition to experiencing similar classroom-based practices as female students - they would achieve 13 points higher on reading, where the gender gap would close by 13 points. The variables that contributed to explaining the gender gap were ones that could be influenced through policy, including students' meta-cognitive abilities in summarizing texts, their enjoyment of reading, their motivation to master tasks and students' self-concept of reading difficulty.[25] As such, policies and efforts to improve boys' learning outcomes should focus on enhancing the aforementioned variables.

The remaining portion of the difference (24 points) remains unexplained by the analysis and could be attributable to factors not measured by PISA, potentially relating to sociocultural or other factors that were unaccounted for in the data or analysis. It may therefore be essential to supplement student achievement data with sociocultural data.

22 Al-Atari, S., Ghawi, G. (2022). PISA 2018: Exploring The Attitudes and Practices of Jordan's Students and Schools Towards Reading. Queen Rania Foundation.

23 Jann, B. (2008) The Blinder–Oaxaca decomposition for linear regression models. *The Stata Journal, 8*(4), 453–479. https://doi.org/10.1177/1536867X0800800401

24 The gender gap calculated in the Oaxaca-blinder decomposition is different from the overall gender gap in public schools, as any missing cases from the predictor variables were excluded from the analysis.

25 More information about each variable and how it contributes to student achievement is highlighted in later sections in the paper.

Grade repetition was a significant predictor of poor student achievement, where students who reported repeating a grade scored 31 points below their peers who did not report repeating a grade; equivalent to 0.8 years of schooling.[26]

These results are aligned with the literature on grade repetition. Evidence suggests that grade repetition is actually more harmful to students than it is beneficial in most cases, and does little to support students in catching up with their peers (Education Endowment Foundation [EEF], 2018a).[27] Repeating a grade further compounds inequities in learning, especially among disadvantaged students, and can be quite costly for education systems (EEF, 2018a). Alternate intervention options include providing intensive individual support to struggling students instead of retaining them. Such support has shown to be highly effective at advancing students' learning if delivered by well-trained and experienced teachers or teaching assistants (EEF, 2018b).[28] It may also be beneficial to group underperforming students and provide them with intensive instruction, to limit costs of one-to-one teaching (EEF, 2018c).[29] Existing teacher practices can be capitalized on to facilitate this. For example, Jordan's 2018 National Teacher Survey showed that 86% of teachers reported observing students while working on particular tasks and providing feedback (Ghawi & AlQbeilat, 2020).[30] Structuring such observations, and using them early on in an academic year to identify which students require more support can be beneficial to avoiding grade repetition.

Student perceptions of parental emotional support were strong significant predictors of achievement.

These results are in line with existing evidence that suggests parents' emotional support can affect students positively, by limiting their anxiety and building confidence, which can create enabling environments for them to succeed (OECD, 2017).[31] It may be essential to relay such findings to schools and parents to promote more positive parental practices that can support students' learning. The effect of parental support on reading achievement was consistent even with the addition of the various sets of variables. However, a drop in the correlation coefficient was evidenced in model 3, with the introduction of students' perceptions towards reading, and in model 4, with the introduction of students' general perceptions and motivations towards learning (Table 2). Considering student perceptions towards reading and general perceptions towards learning may be influenced by parental views and attitudes, this drop is unsurprising. Indeed, correlations show moderate positive relationships between parents' emotional support and students' self-efficacy, their perceptions towards reading, their self-concept of reading comprehension and motivation to master tasks. These results further highlight the importance of positive parental support. Therefore, it may be essential to encourage parents to show their children emotional

26 It is important to note that one in every 10 students in Jordan reported repeating a grade (Ghawi & Dahdah, 2020). Ghawi, G., Dahdah, S. (2020). PISA 2018: Exploring Jordan's performance. Queen Rania Foundation.

27 Education Endowment Foundation. (2018). Repeating a year: teaching and learning toolkit. Retrieved from: https://educationendowmentfoundation.org.uk/pdf

28 Education Endowment Foundation. (2018). One to one tuition: teaching and learning toolkit. Retrieved from: https://educationendowmentfoundation.org.uk/pdf

29 Education Endowment Foundation. (2018). Small group tuition: teaching and learning toolkit. Retrieved from: https://educationendowmentfoundation.org.uk/pdf

30 Ghawi, G., AlQbeilat, N. (2020). Jordan's Teachers in a Global Landscape. Ministry of Education – Queen Rania Foundation: Amman. Retrieved from: https://www.qrf.org/sites/default/files/2021-01/jordans_teachers_in_a_global_landscape.pdf

31 OECD (2017), PISA 2015 Results (Volume III): Students' Well-Being, PISA, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264273856-en

support and avoid placing pressure on them, as it may exacerbate their feelings of stress and limit their ability to succeed (Gherasim and Butnaru, 2012).[32] Achieving this may be facilitated through existing school practices. Jordan's 2018 National Teacher Survey showed that more than seven in ten Ministry of Education principals reported providing parents with workshops or courses and all principals reported having parent meetings.[33] Principals and teachers can be trained on how to provide parents with tips on positively engaging with children, and relay this information to them during such workshops or parent meetings.

Students from immigrant backgrounds were significantly more likely to score higher on reading compared to their non-immigrant peers, a difference of nearly 13 points higher; equivalent to a 0.3 year of schooling.

Jordan was one of the few PISA participating countries in which students from immigrant backgrounds outperformed their non-immigrant peers. The trend was consistent even when accounting for the socioeconomic profiles of students and schools (OECD, 2019).[34] These results are positive, and may suggest that the education system in Jordan has been equitable and inclusive in its response to immigrant students. These results may also be a function of better trained teachers teaching immigrant students. Teacher training was not captured in the PISA dataset for Jordan, but Jordan's 2018 National Teacher Survey showed that a larger proportion of grade 4-10 teachers in Syrian second shift and Syrian camp schools reported receiving in-service training in the two years prior to the survey, compared to their counterparts in regular MoE or host-community schools (Ghawi & Hattab).[35] In order to better understand why immigrant students outperform their non-immigrant peers, it would be important to capture teacher training in the PISA dataset. It would also be essential to identify how long immigrant students have been in the Jordanian education system, and to what extent they had foundational reading skills prior to entering it. This would help in explaining the gap between immigrant and non-immigrant students' performance.

Students from more advantaged backgrounds were significantly more likely to have higher reading scores than their peers from disadvantaged backgrounds.

This result is unsurprising, as the learning outcomes of students from all countries and economies participating in PISA varied based on socioeconomic status (OECD, 2019).[36] The true effects of socioeconomic status on student achievement in Jordan may be smaller or larger than what is currently reflected by the PISA data, considering fewer than 65% of the 15-year-old population in

32 Gherasim, L.R. and S. Butnaru (2012), "The effort attribution, test anxiety and achievement in sciences: The moderating effect of parental behaviour", *International Journal of Learning. 18*(10) pg. 283-291. DOI: 10.18848/1447-9494/CGP/v18i10/47671

33 Queen Rania Foundation & Ministry of Education (2021). Data exploration tool – Jordan National Teacher Survey 2018: Principal Data. Accessed on: https://qrfsurveys.shinyapps.io/NTS_principals_EN/

34 OECD (2019), *PISA 2018 Results (Volume II): Where All Students Can Succeed*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/b5fd1b8f-en.

35 Data available from Figure 2 in: Ghawi, G., Hattab, K. (2020). Teachers of Refugees: Findings from Jordan's 2018 National Teacher Survey. Ministry of Education – Queen Rania Foundation: Amman. Retrieved from: https://www.qrf.org/sites/default/files/2021-01/teachers_of_refugees_findings_from_jordans_2018_national_teacher_survey.pdf

36 OECD (2019), *PISA 2018 Results (Volume II): Where All Students Can Succeed*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/b5fd1b8f-en.

Jordan was covered in the 2018 sample (OECD, 2019). For example, the influence of socioeconomic status may be underestimated if students from the lowest income levels drop-out of school early as a result of poor performance (OECD, 2019). Therefore, it is difficult to ascertain the actual level of inequity in learning. However, research has also continuously shown that students' socioeconomic status influences their achievement, with students from more advantaged backgrounds outperforming their less advantaged peers (Hanushek & Woessmann, 2010).[37] As such, despite the effect of socioeconomic level not being fully captured, it is essential to be taken into account in reform efforts. Jakubowski et al. (2019) suggest differences in student achievement as a result of socioeconomic status arise because the education system is not able to minimize the effects of family background characteristics on student learning.[38] A more equitable education system would be better able to ensure all students are learning equally. More should be done at the system-level to limit the effects of family background in learning at school. One important and highly effective intervention would be to ensure all students are receiving high quality pre-school education, as quality pre-school education and investments in early childhood have been shown to yield positive benefits for disadvantaged students (Heckman, 2006).[39] This is discussed further below through the lens of the Jordanian context. Other interventions could be supporting families to better support their children's learning in the early years throughout their schooling, as parents' socioemotional support (OECD, 2017)[40] and involvement (Wilder, 2014)[41] are linked to students' achievement.

The only student background characteristic that did not significantly predict reading literacy among 15 year olds was pre-school attendance. Students who attended preschool for more than one year had similar outcomes when compared to those who attended preschool for less than one year or not at all.[42]

Research has robustly shown that students who attend high-quality preschools have better educational, health, socio-emotional and economic outcomes than peers who do not attend (Elango, Hojman, Garcia & Heckman, 2016).[43] However, the regression in this analysis showed no significant influence of pre-school attendance on reading performance. While this result may be a function of the limitations associated with the way the question was asked,[44] it may also be a function of the quality of the preschools in Jordan. If the quality of pre-schools students attended was not high, the expected benefits of attendance may not be observed. Investing in the quality of early childhood development (ECD) in Jordan should be a priority, as investments in ECD yield

37 Hanushek, E. A., & Woessmann, L. (2010). The Economics of International Differences in Educational Achievement

38 Jakubowski M., Alromi N., Gajderowicz T., Alshumrani S., Rogala M., Jamjoom S., (2019), Arabic-speaking countries in international student assessments, http://www.evidin.pl/wp-content/uploads/2020/04/20200409-Arabic-speaking-countries-in-international-student-assessments.pdf

39 Heckman, J.J. (2006) Skill formation and the economics of investing in disadvantaged children. *Science 312*(5782): 1900– 1902. https://doi.org/10.1126/SCIENCE.1128898

40 OECD (2017), PISA 2015 Results (Volume III): Students' Well-Being, PISA, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264273856-en

41 S. Wilder (2014) Effects of parental involvement on academic achievement: a meta-synthesis, *Educational Review, 66*(3), 377-397, DOI: 10.1080/00131911.2013.780009

42 It is important to note that 90% of students reported attending pre-school (Ghawi & Dahdah, 2020). Ghawi, G., Dahdah, S. (2020). PISA 2018: Exploring Jordan's performance. Queen Rania Foundation. https://www.qrf.org/sites/default/files/2020-10/pisa_2018_exploring_jordans_performance_in_the_2018_cycle_-_qrf.pdf

43 Sneha Elango, Andrés Hojman, Jorge Luis García, and James J. Heckman. (2016). "Early Childhood Education." Forthcoming, in Moffitt, Robert (ed.), Means-Tested Transfer Programs in the United States II. Chicago: University of Chicago Press. Retrieved from: https://heckmanequation.org

44 Noted in the limitations section of the paper.

substantial social and economic returns (Elango et al., 2016). Such investments are also important as ECD can support disadvantaged children (Elango et al., 2016), and potentially limit the impact of socio-economic status on student outcomes.

The Ministry of Education and UNICEF made plans to universalize access to kindergarten at level two in 2017, and a UNICEF report in 2019 suggests the focus of the investments has been on personnel costs and building new classrooms and schools to increase access.[45] The plan to universalize access has not been met yet, so it is essential that quality of new, and existing settings, is not overlooked in these efforts. Finally, it is important that investments in early childhood begin at an even earlier stage than kindergarten level two. While the cost of investments may be high, Heckman (2006) has shown that the earlier the investment in early childhood, the higher the rate of economic returns.[46] This has implications for multiple ministries in Jordan, including social development and health, considering responsibility for earlier stages of early childhood development and education is shared across these entities.

Meta-cognitive abilities explained an additional 2% of the variance in students' reading achievement when added to the student background characteristics, with a total variance explained of 25% (Table 2).

Metacognition relating to students' knowledge of the most useful strategies to use when summarizing, understanding and remembering texts, showed a significant positive relationship with student scores. [47] [48]

This effect was persistent even with the addition of other student, teacher and school level variables to the regression model (Table 2). This finding is corroborated in the literature, as many studies have found positive links between metacognition and student learning (Donker, de Boer, K**ostons,** van Ewjik & van der Werf, 2014).[49] Despite a link being evidenced between these meta-cognitive tasks and reading, descriptive data showed that overall, students' average meta-cognitive abilities were below their average OECD peers. These findings have important implications as to what is taught in the classroom. Explicit instruction on strategies to help students in tackling tasks may advance their meta-cognitive and reading abilities (EEF, 2019).[50] Another way to do this would be for teachers to model their own thinking processes and verbalize them for specific tasks, which is an effective strategy to also ensure metacognition is embedded into teaching and learning activities (EEF, 2019). Teachers should be trained on such strategies to be able to develop students' meta-cognitive abilities and advance learning.

45 UNICEF. (2019). Budget brief 2019: Public education sector in Jordan. Retrieved from: http://www.esc.jo/Documents/175c05a3-d1f4-441f-919f-374c1281cbe8.pdf

46 Heckman, J.J. (2006) Skill formation and the economics of investing in disadvantaged children. *Science 312*(5782): 1900– 1902. https://doi.org/10.1126/SCIENCE.1128898

47 Metacognition is defined as an individual's knowledge of their cognition (Dinsmore, Alexander & Loughlin, 2008.) Dinsmore, D. L., Alexander, P. A. & Loughlin, S. M. (2008). Focusing the conceptual lens on metacognition, self-regulation and self-regulated learning. *Educational Psychology Review, 20*, 391-409.

48 More information on students' knowledge of these strategies can be found in a previous paper: Al-Atari, S., Ghawi, G. (2022). PISA 2018: Exploring The Attitudes and Practices of Jordan's Students and Schools Towards Reading. Queen Rania Foundation..

49 Donker, A. S., de Boer, H., Kostons, D., Dignath van Ewijk, C. C., & van der Werf, M. P. C. (2014). *Effectiveness of learning strategy instruction on academic performance: A meta-analysis. Educational Research Review, 11, 1–26.* https://doi.org/10.1016/j.edurev.2013.11.002

50 Education Endowment Foundation. (2019). Metacognition and self-regulated learning: Summary of recommendations. Retrieved from: https://educationendowmentfoundation.org.uk

Perceptions towards and reading and reading abilities explained an additional 6% of the variance in student achievement scores when added to student characteristics and metacognitive abilities, explaining a total of 31% of the variance.

Students with more favorable views towards reading were more likely to score significantly higher on the reading domain.[51]

It is important to note however, that the relationship between reading and attitudes towards reading is bi-directional (Jakubowski et al., 2019). Students who enjoy reading tend to read more often, hence they practice reading more often, further developing their abilities. Additionally, students who are good readers tend to enjoy reading to a greater extent because they are able to read well. This suggests that teachers should focus on both providing high-quality reading instruction and supporting students in developing positive attitudes towards reading (Jakubowski et al., 2019). High-quality reading instruction, focusing on reading comprehension strategies may be an effective approach (Higgins, Katsipataki & Coleman, 2014).[52] This can include teaching students to monitor their understanding of texts, summarizing key points and questioning the texts they read (Higgins et al., 2014). Older, struggling readers have been shown to benefit from such an intervention by an average of four months' learning progress (Higgins et al., 2014). High-quality teacher professional development would be required to enable teachers to implement such practices. At the system-level, it may be beneficial to dedicate a daily reading hour or sustained silent reading in classrooms to encourage students to hone their reading skills and improve attitudes towards reading. Reading hour policies have been implemented in England, and evidence suggests that students' reading literacy and attitudes towards reading improved as a result (Machin & McNally, 2008).[53] Interestingly, boys benefitted from the literacy hour to a greater extent than girls, which is especially noteworthy for the Jordanian context considering female students substantially outperformed their male counterparts in reading literacy on PISA (Ghawi & Dahdah, 2020).[54] Piloting such a policy in the Jordanian context would be beneficial to explore whether it can influence reading achievement and attitudes. Importantly, teachers would need to be trained on ways to make effective use of reading time, in addition to strategies to promote reading enjoyment among students.

Students' self-concept[55] of reading comprehension and reading difficulties were both significantly associated with reading scores.

Higher perceptions of self-concept in reading comprehension predicted significantly higher reading scores, while higher perceptions of reading difficulty predicted significantly lower reading scores. These results are aligned with existing research on self-concept, which show there is

51 More information on the amount of texts students reported reading and the content they read is available in Queen Rania Foundation *Al-Atari, S., Ghawi, G. (2022). PISA 2018: Exploring The Attitudes and Practices of Jordan's Students and Schools Towards Reading. Queen Rania Foundation.*

52 Higgins, S., Katsipataki, M., & Coleman, R. (2014). Reading at the Transition: Interim Evidence Brief. Retrieved from: https://educationendowmentfoundation.org.uk

53 Machin, S., & McNally, S. (2008). The literacy hour. *Journal of Public Economics, 92*(5-6), 1441–1462. Retrieved from: https://doi.org/10.1016/j.jpubeco.2007.11.008

54 Ghawi, G., Dahdah, S. (2020). PISA 2018: Exploring Jordan's performance. Queen Rania Foundation. Retrieved from: https://www.qrf.org/sites/default/files/2020-10/pisa_2018_exploring_jordans_performance_in_the_2018_cycle_-_qrf.pdf

55 Self-concept generally refers to an individual's beliefs and perceptions about themselves, their skills or abilities (Dulay, 2017)

a strong relationship between self-concept and achievement (Dulay, 2017).[56] Some research suggests that self-concept and academic achievement reinforce each other; students with higher confidence and beliefs typically score higher, which then reinforces their self-concept in their abilities (Dulay, 2017). Researchers have suggested that intervention programs should aim to improve students' skills and self-concept (Huang, 2011),[57] to achieve longer term effects (Marsh & Craven, 2006).[58] This is also important for teachers to consider in the classroom and parents to consider at home; positive reinforcement of good practices and eliminating negative feelings students may have about themselves and their performance may be beneficial in improving their skills (Marsh & Scalas, 2011).[59] Teachers and the school could also communicate such practices to parents, to ensure positive parental engagement and support to their children, which has been shown to be positively linked with student attainment.

Students' general perceptions towards learning and motivation explained an additional 2% of the variance in student achievement scores when added to student background characteristics, meta-cognitive abilities and perceptions towards reading.

Students' motivation to master tasks and their growth mindset[60] were significantly and positively associated with reading, while their self-efficacy and learning goals were not.

Students with a growth mindset scored nearly 19 points higher than their peers who did not have a growth mindset, which is roughly equivalent to half a year of schooling. Research suggests that students with a growth mindset tend to expend more effort in their tasks (OECD, 2019)[61] and use effective strategies in learning, such as responding to feedback, learning from experience and attempting new learning strategies (Dweck, 2016).[62] It is essential for teachers and parents to gain knowledge on ways to nurture a growth mindset. For parents, it is important that they praise their children's efforts and strategies, instead of innate abilities (Gunderson et al., 2013).[63] For teachers, this can be done by teachers helping their students believe that the effort they exert and the learning strategies they adopt are the sources of their success (OECD, 2019). Teachers should also foster positive beliefs; that all students are capable of learning and succeeding and create an

56 Dulay, S. (2017). The Effect of Self-concept on Student Achievement. In *The Factors Effecting Student Achievement*. Springer International Publishing AG 2017. https://doi.org/10.1007/978-3-319-56083-0

57 Huang, C. (2011). Self-concept and academic achievement: A meta-analysis of longitudinal relations. *Journal of School Psychology, 49*(5), 505–528. Retrieved from http://dx.doi.org/10. 1016/j.jsp.2011.07.001

58 Marsh, H. W., & Craven, R. G. (2006). Reciprocal effects of self-concept and performance from a multidimensional perspective: Beyond seductive pleasure and unidimensional perspectives. *Perspectives on Psychological Science, 1*(2), 133–163.

59 Marsh, H. W., & Scalas, L. F. (2011). Self-concept in learning: Reciprocal effects model between academic self-concept and academic achievement. Social and Emotional Aspects of Learning, 191–198.

60 A growth mindset reflects an individual's belief that they can become good at something through effort and learning (Dweck, 2006). This is different from self-concept as self-concept reflects an individuals' belief in their current skills and abilities.

61 OECD (2019), PISA 2018 Results (Volume III): *What School Life Means for Students' Lives*, PISA, OECD Publishing, Paris, Retrieved from: https://doi.org/10.1787/acd78851-en.

62 Dweck, C. (2016), "What having a "growth mindset" actually means", *Harvard Business Review,* Retrieved from: https://hbr.org/2016/01/what-having-a-growth-mindset-actually-means

63 Gunderson, E. A., Gripshover, S. J., Romero, C., Dweck, C. S., Goldin-Meadow, S., & Levine, S. C. (2013). Parent Praise to 1- to 3-Year-Olds Predicts Children's Motivational Frameworks 5 Years Later. *Child Development, 84*(5), 1526–1541. https://doi.org/10.1111/cdev.12064

appropriate learning environment in the classroom (OECD, 2019). Integrating the teaching of such strategies and beliefs into teacher professional development and pre-service programs could be highly beneficial in supporting the development of students' growth mindset, and consequently their motivation to learn and levels of effort (Blackwell, Trzesniewski & Dweck, 2007).[64] This is also important as motivation has also been shown to have a positive – albeit small - effect on student achievement (Özen, 2017).[65] Indeed, the regression analysis showed that students' motivation to master tasks was a positive predictor of reading literacy.

There was no significant relationship between students' reported self-efficacy beliefs and reading literacy. Students' general self-efficacy is their belief in their own abilities to perform specific tasks, particularly in adverse situations (Bandura, 1977).[66] Research suggests that students who have lower perceptions of their abilities do not reach their full potential and limit their own educational and even career prospects (Bandura, Barbaranelli, Caprara & Pastorelli, 2001).[67] However, descriptive analysis suggests that, on average, students in Jordan had high reported self-efficacy beliefs, which were at times similar to or even higher than the average OECD student's reported self-efficacy (OECD, 2019).[68] These results indicate that, in Jordan, students' self-efficacy beliefs do not match their abilities, so no relationship was evident. It may be essential to improve students' metacognitive skills, to consequently improve their self-efficacy, as research suggests that self-efficacy and metacognitive abilities are related. Students with higher metacognitive skills tend to have a higher sense of self-efficacy (Cera, Mancini & Antonietti, 2013).[69] Improving metacognition, and as a result self-efficacy and learning, can yield positive benefits as self-efficacy impacts students' motivation and behaviors (Bandura, 1991).[70]

Similarly, students' perceptions of their learning goals were not significant predictors of achievement. This is despite some research suggesting that setting goals and student achievement are positively associated (Moeller, Theiler & Wu, 2011).[71] Descriptive analysis shows that the average student in Jordan reported setting high learning goals for themselves, which were on average, higher than the OECD student's learning goals. Students may have felt social desirability to respond in more favorable ways to questions regarding their learning goals, which may have influenced the findings.

64 Blackwell, L., K. Trzesniewski and C. Dweck (2007), "Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention", *Child Development, 78*(1), 246-263, Retrieved from: http://dx.doi.org/10.1111/j.1467-8624.2007.00995.x.

65 Özen, S. O. (2017). The Effect of Motivation on Student Achievement. In *The Factors Effecting Student Achievement* (pp. 35–56). Retrieved from: https://doi.org/10.1007/978-3-319-56083-0

66 Bandura, A. (1977), "Self-efficacy: Toward a unifying theory of behavioral change", *Psychological Review, 84*(2), 191-215, Retrieved from: http://dx.doi.org/10.1016/0146-6402(78)90002-4.

67 Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (2001), "Self-efficacy beliefs as shapers of children's aspirations and career trajectories", *Child Development, 72*(1), 187-206, Retrieved from: http://dx.doi.org/10.1111/1467-8624.00273.

68 OECD (2019), *PISA 2018 Results (Volume III): What School Life Means for Students' Lives*, PISA, OECD Publishing, Paris, Retrieved from: https://doi.org/10.1787/acd78851-en.

69 Cera, R., Mancini, M., & Antonietti, A. (2013). Relationships between Metacognition, Self-efficacy and Self-regulation in Learning. *Journal of Educational, Cultural and Psychological Studies, 7*, 115–141. https://doi.org/10.7358/ecps-2013-007-cera

70 Bandura, A. (1991), "Social cognitive theory of self-regulation", *Organizational Behavior and Human Decision Processes, 50*(2), 248-287, Retrieved from: http://dx.doi.org/10.1016/0749-5978(91)90022-L.

71 Moeller, A. J., Theiler, J. M., & Wu, C. (2011). Goal Setting and Student Achievement: A Longitudinal Study. *The Modern Language Journal, 96*(2), 153–169. https://doi.org/10.1111/j.1540-4781.2011.01231.x

Variables relating to classroom-based practices did not explain any additional variance in reading literacy achievement.

Students' perceptions of teacher support and the length of time spent in the Arabic language lesson were not significantly associated with reading scores.

Contrastingly, a positive association between reading performance and learning time was evidenced among OECD countries (OECD, 2020),[72] where students' reading improved with every additional hour spent in the language lesson per week, for up to three hours of learning time.[73] The OECD (2020) suggests there are multiple factors that may influence the effectiveness of learning time, including instructional practices and student attitudes towards learning. Considering that students' attitudes towards learning and some instructional practices were controlled for in this analysis, it may be other unaccounted for teacher practices or the quality of instruction that are influencing the effectiveness of learning time. Indeed, spending more time in the classroom may not necessarily mean students are receiving more quality teaching. Jordan's 2018 National Teacher Survey showed that the average grade 7-10 teacher spends 58% of lesson time on teaching and learning activities, compared to an average of 78% among OECD country teachers (Ghawi & AlQbeilat, 2020).[74] Teacher reports showed that more than 40% of lesson time in Jordan was spent on administrative tasks and keeping order in the classroom. Additionally, the World Bank's Global Education Policy Dashboard (2021) showed that one in three of Jordan's teachers did not have satisfactory pedagogical practices and only a third achieved basic proficiency in the content they teach.[75] Policies targeting reading literacy in the classroom should therefore focus on enhancing the quality of teachers' instructional practices, in addition to their classroom management to ensure lesson time is being used effectively with more focus and time spent on teaching and learning activities.

However, two teacher level variables; students' perceptions of teachers' adaptive practices and the longest number of pages students reported reading for the Arabic language lesson, were significant positive predictors of reading.

Students who reported that the longest text they had to read for their Arabic language lesson was at least two pages scored nearly 10 points higher than their peers who reported reading one page or fewer. These results suggest it is essential for students to read more pages of text for Arabic lessons to practice reading and build their reading stamina.[76] Schools should be providing students with various reading resources to choose from and read, and ensure that there are resources available to suit learners' different proficiency levels. This is essential as reading at the appropriate level supports in developing a learner's vocabulary, improving their motivation towards

72 OECD (2020), *PISA 2018 Results (Volume V): Effective Policies, Successful Schools*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/ca768d40-en.

73 There was a weaker association between attending more than three hours of language lessons per week and performance in OECD countries.

74 Ghawi, G., AlQbeilat, N. (2020). Jordan's Teachers in a Global Landscape. Ministry of Education – Queen Rania Foundation: Amman. Retrieved from: https://www.qrf.org/sites/default/files/2021-01/jordans_teachers_in_a_global_landscape.pdf

75 The World Bank. (2021). Global Education Policy Dashboard. Retrieved from: https://www.educationpolicydashboard.org/indicator_timetrend/jor/7/28

76 Stamina in reading refers to the ability to maintain the mental effort (i.e., focus) when reading a text without scaffolds or adult support (Hiebert, 2014, p.3). For further information see Hiebert, E. H. (2014). The forgotten reading proficiency: stamina in silent reading. TextProject Article Series. Santa Cruz, CA: TextProject.

reading, increases reading frequency and student proficiency more generally (Albay, 2017).[77] It is also important for teachers to be able to integrate these different resources into their teaching and adapt tasks to meet students' different abilities. Researchers suggest that such adaptive teaching, especially when teaching reading (Anders, Hoffman & Duffy, 2000)[78] and implementing open-ended tasks (Maloch, 2004),[79] is necessary. Indeed, the results of the regression show a significant positive relationship between reading and adaptive teaching. Researchers suggest that effective teachers are ones which are able to adapt lesson content to meet learner needs (Parsons, 2012).[80] The results on classroom-based practices overall suggest that to improve students' reading literacy, it is essential to focus on teacher practices within the classroom, such as improving instruction, enhancing adaptive teaching, the resources they provide their students and classroom management practices. Little value would ensue from prolonging lesson time if instructional and classroom practices remain the same.

School-level factors did not explain any additional variance in reading literacy achievement, and none of the variables were significant predictors of reading literacy.

Student-to-teacher ratios, proportion of teachers fully certified and shortages in educational staff and material were not significantly associated with students' reading scores. These results may suggest that school resources are not an essential contributing factor to student achievement. Alternatively, they may suggest that there is not enough variation between schools in the amount or quality of resources and teachers to elicit a significant effect. Exploring the descriptive data more closely, it is evident that there was not much variation in the proportion of fully certified teachers and student to teacher ratios, with most principals reporting that teachers in their schools were fully certified and an average student-to-teacher ratio of 20 to one. While the proportion of fully certified teachers at school was not associated with student scores, this finding should be taken with a grain of salt. Teacher certification requirements at the time of PISA 2018 data collection only mandated that teachers have a Bachelor's degree (MoE, 2014).[81] There was no requirement of a pre-service degree in education or specification for a practicum. As such, having certified teachers may not necessarily indicate that those teachers are better qualified or have the skills to deliver quality instruction in the classroom. The MoE in Jordan are working to develop a teacher licensing system (QRF, 2017)[82] and it would be beneficial to explore the relationship between certification and student scores following the implementation of the new licensing system. Meanwhile, the descriptive data suggest there was variability in the shortage of educational staff and material. However, the data do not highlight whether there is enough variety in available materials in terms of content, difficulty or quality.

Overall, these findings corroborate existing research which suggests that there is no strong or

77 Albay, M. (2017). The Benefits of Graded Reading. *International Journal of Social Sciences & Educational Studies, 3*(4), 177-180. Retrieved from: https://doi.org/10.23918/ijsses.v3i4p177

78 Anders, P. L., Hoffman, J. V., Duffy, G. G. (2000). Teaching teachers to teach reading: Paradigm shifts, persistent problems, and challenges. In Kamil, M. L., Mosenthal, P. B., Pearson, P. D., Barr, R. (Eds.), *Handbook of reading research,* 3, 719-742. Mahwah, NJ: Lawrence Erlbaum.

79 Maloch, B. (2004). On the road to literature discussion groups: Teacher scaffolding during preparatory experiences. *Reading Research and Instruction, 44*(2), 1-20. https://doi.org/10.1080/19388070409558424

80 Parsons, S.A. (2012) Adaptive Teaching in Literacy Instruction: Case Studies of Two Teachers. *Journal of Literacy Research. 44*(2), 149-170. doi:10.1177/1086296X12440261

81 MoE. (2014). Education Law Number 3 of 1994. Retrieved from: http://wbgfiles.worldbank.org/documents/hdn/ed/saber/supporting_doc/MNA/Teachers/Jordan/S1%20Education%20Law-Jordan.pdf

82 QRF. (2017). QRF Fact Sheet: *Teaching in Jordan.* Retrieved from: https://www.qrf.org/sites/default/files/2019-07/teaching_in_jordan_brief_en_condensed.pdf

consistent relationship between performance and school resources (Hanushek, 1997).[83] However, it is difficult to draw conclusive conclusions from this set of data alone. It would be essential to further explore the nature and quality of resources in Jordan, prior to making conclusions about whether or not they should be the focus of interventions and investments. Until more evidence is available, it may be more beneficial to prioritize investment in teachers' classroom management practices, for example, to strengthen their capacity in managing larger class sizes and more effectively meeting the needs of different students. This is especially important considering Jordan's 2018 National Teacher Survey finding that a quarter of lesson time is dedicated to keeping order in the classroom (Ghawi & AlQbeilat, 2020).[84]

83 Hanushek, E. A. (1997). Assessing the Effects of School Resources on Student Performance: An Update. Educational Evaluation and Policy Analysis, 19(2), 141–164. Retrieved from http://hanushek.stanford.edu/sites/default/files/publications/ Hanushek 1997 EduEvaPolAna 19%282%29.pdf

84 Ghawi, G., AlQbeilat, N. (2020). Jordan's Teachers in a Global Landscape. Ministry of Education – Queen Rania Foundation: Amman.

TABLE 2: THE REGRESSION MODELS[85]

		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Student background characteristics	Repeated a grade	**-51.43**	**-47.90**	**-41.61**	**-39.24**	**-36.60**	**-31.04**
	Immigrant	**18.03**	**18.38**	**17.49**	**14.61**	**14.85**	**12.55**
	Socio-economic status	**11.77**	**10.77**	**8.57**	**7.64**	**7.99**	**7.43**
	Perceived parental emotional support	**16.44**	**16.40**	**9.85**	**5.97**	**4.80**	**4.84**
	Female	**38.10**	**32.52**	**26.10**	**23.03**	**20.34**	**22.46**
	Attending ECD for more than one year	-2.29	0.71	1.40	1.58	1.79	-0.15
Meta-cognition	Summarizing		**8.94**	**9.70**	**9.18**	**9.20**	**8.00**
	Understanding and remembering		**7.81**	**6.13**	**5.02**	**4.37**	**4.22**
Perceptions towards reading	Enjoyment of reading			**8.84**	**5.50**	**4.55**	**5.16**
	Self-concept: reading comprehension			**12.62**	**8.43**	**5.74**	**6.15**
	Self-concept: reading difficulty			**-11.48**	**-10.43**	**-11.53**	**-10.82**
Students' general perceptions towards learning	Self-efficacy				2.42	1.10	1.23
	Students' learning goals				-0.59	-0.93	-0.65
	Motivation to master tasks				**10.63**	**10.17**	**9.00**
	Growth mindset				**16.17**	**16.92**	**18.69**
Teacher factors	Students' perception of teacher's adaptive instruction					**3.54**	**4.42**
	Students' perceptions of teacher support					-0.58	-0.09
	Longest number of pages ever had to read					**10.87**	**9.54**
	Arabic language learning time					0.02	0.05
School level factors	Shortage of educational staff						3.66
	Shortage of educational material						-2.22
	Proportion of all teachers fully certified						4.81
	Student to teacher ratios						0.47
	Constant	**418.03**	**429.45**	**425.42**	**417.50**	**411.61**	**385.86**
	R-squared	**0.23**	**0.25**	**0.31**	**0.33**	**0.31**	**0.31**

85 Numbers in bold are significant at the p<.05 level.

CONCLUDING REMARKS

This paper summarized some of the key determinants of student achievement from the exploration of student background characteristics, student beliefs and attitudes, classroom-based practices and school level factors. Key recommendations were highlighted around teacher practices and classroom behaviors, student beliefs and support at home, and system-level interventions; summarized below.

At the heart of many of the reform efforts highlighted in the paper are teachers; teacher professional development should enhance teachers' abilities to promote metacognition, a growth mindset, motivation in the classroom, students' self-concept, reading activities and pedagogical practices within the classroom. Such knowledge and skills should also be embedded in pre-service education programs to effectively equip new teachers with the skills to enhance student learning. It may be especially important to support male teachers on this front, as the analysis revealed that many of these factors contribute to the gender gap in achievement.

Additionally, teachers and school leaders should be trained on what constitutes positive parental engagement and ways to communicate this knowledge with parents, to support them in implementing positive practices at home. This is essential as the results highlight that parents' support plays an important role in students' achievement, and promoting such engagement can yield many benefits. This can also include raising parents' awareness about how to develop their children's growth mindsets, self-concept and self-efficacy beliefs.

At the system-level, it is essential for more investments to be made at the preschool level. Investing in the quality of existing and new preschools is imperative, as is investing in earlier stages of pre-school. The Ministry of Education's focus has been on increasing access to kindergarten at level two. However, there is a need to also begin investments at earlier stages, such as nursery and kindergarten level one, to maximize returns on investments. High quality early childhood development programs have been shown to positively impact all students, especially those who are disadvantaged, and may support in bridging the gap between the less and more fortunate. Additionally, replacing grade repetition with one-to-one or group tuition interventions to support students who may be struggling with schooling. This is especially important as grade repetition has been shown to be detrimental, especially for disadvantaged students.

It would also be worthwhile to explore the effectiveness of implementing a reading hour of sustained silent reading sessions during the school day as a means to advance students' reading literacy and motivation. Such interventions would need to be coupled with teacher training on how to instill a love of reading among students and make the most effective use of reading time.

It is evident that what is required to advance students' literacy learning is a system-wide approach, targeting teachers, schools, ministries, and importantly, parents who are part and parcel of shaping students' learning. These efforts should not be limited to 15-year-old students

and their teachers; although the PISA data examines 15-year-old students, many of the student behaviors, perceptions and skills observed are an accumulation of students' past knowledge and experiences. Therefore, conclusions drawn from this paper should have implications for the wider school system, and should not be limited to 15-year-old students and their teachers. For example, fostering a love of reading should be embedded in students' education as early as possible, developing a growth mindset and motivation for learning should also be the focus of teacher professional development across different grade levels, as well as increasing teaching and learning lesson time for all students.

APPENDIX A

TABLE 1A: A DESCRIPTION OF THE VARIABLES USED IN THE REGRESSION ANALYSIS

	Variable and variable type	Items/levels within
Student background characteristics	Gender (binary)	Female / male
	Immigration status (binary)	Immigrant / native
	Pre-school attendance (binary)	Attended pre-school for more than one year / attend for less than one year
	Grade repetition (binary)	Reported repeating a grade / did not report repeating a grade
	Socio-economic status (index)	Parents' highest level of education Parents' highest occupational status Household possessions
	Parents' emotional support (index)	My parents support my educational efforts and achievements My parents support me when I am facing difficulties at school My parents encourage me to be confident
Meta-cognition	Meta cognition: summarizing (index)	Usefulness for writing a summary: I write a summary. Then I check that each paragraph is covered in the summary… I try to copy out accurately as many sentences as possible. Before writing the summary, I read the text as many times as possible. I carefully check whether the most important facts in the text are represented… I read through the text, underlining the most important sentences. Then I write…
	Meta cognition: understanding and memorizing text (index)	Usefulness for understanding and memorizing text: I concentrate on the parts of the text that are easy to understand. I quickly read through the text twice. After reading the text, I discuss its content with other people. I underline important parts of the text. I summarize the text in my own words. I read the text aloud to another person.

Perceptions towards reading	Enjoyment of reading (index)	I read only if I have to Reading is one of my favorite hobbies I like talking about books with other people For me, reading is a waste of time I read only to get information that I need
	Self-concept of reading comprehension (index)	I am a good reader I am able to understand difficult texts I read fluently
	Self-concept of reading difficulty (index)	I have always had difficulty with reading I have to read a text multiple times before completely understanding it I find it difficult to answer questions about a text
Students' general perceptions towards learning	Self-efficacy (index)	I usually manage one way or another I feel proud that I have accomplished things I feel that I can handle many things at a time My belief in myself gets me through hard times When I'm in a difficult situation, I can usually find my way out of it
	Learning goals	My goal is to learn as much as possible My goal is to completely master the material presented in my classes My goal is to understand the content of my classes as thoroughly as possible
	Motivation to master tasks	I find satisfaction in working as hard as I can Once I start a task, I persist until it is finished Part of the enjoyment I get from doing things is when I improve on my past performance If I am not good at something, I would rather keep struggling to master it than move on to something I may be good at
	Growth mindset (binary)	Agree or strongly agree with statement "Your intelligence is something about you that you can't change very much." vs. Disagree or strongly disagree
Teacher-level factors	Longest number of pages ever had to read (binary)	One page or fewer / at least two pages
	Teacher support (index)	The teacher gives extra help when students need it The teacher helps students with their learning The teacher continues teaching until the students understand
	Arabic language learning time (continuous)	"Learning time in test language (LMINS) was computed by multiplying the number of minutes on average in the test language class by number of test language class periods per week" (OECD, 2017; page 299)[86]
	Adaptive teaching instruction (index)	The teacher adapts the lesson to my class's needs and knowledge The teacher provides individual help when a student has difficulties understanding a topic or task The teacher changes the structure of the lesson on a topic that most students find difficult to understand

86 OECD. (2017). PISA 2015 Technical Report. Retrieved from: https://www.oecd.org/pisa/sitedocument/PISA-2015-Technical-Report-Chapter-16-Procedures-and-Construct-Validation-of-Context-Questionnaire-Data.pdf

School-level factors	Shortage of educational staff (index)	A lack of teaching staff Inadequate or poorly qualified teaching staff A lack of assisting staff Inadequate or poorly qualified assisting staff
	Shortage of educational material (index)	A lack of educational material (e.g. textbooks, IT equipment, library or laboratory material) Inadequate or poor quality educational material A lack of physical infrastructure (e.g. building, grounds, heating/cooling, lighting and acoustic systems) Inadequate or poor quality physical infrastructure
	Proportion of all teachers fully certified (index)	"The proportion of fully certified teachers (PROATCE) was computed by dividing the number of fully certified teachers by the total number of teachers." (OECD, 2017; page 322)
	Student to teacher ratio (continuous)	n/a

It is important to note that other predictor variables were also considered for the regression. However, variance inflation factor analysis was run to explore whether there was multicollinearity among the independent variables.[87] Any variable with a variance inflation factor greater than 2 was removed.[88] As such, despite considering a greater number of variables, the final variables used in the analysis are those outlined in Table 1.

87 Multicollinearity is when independent variables in a regression model are correlated.

88 Typically, variables are removed when the VIF is greater than 5 or 10. QRF chose to be more conservative in their VIF cut-off, to ensure the regression was more accurate.