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All Children Reading—Asia

Report on the 2021 Uzbekistan National Early Grade Reading and Mathematics Assessments

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ACR-ASIA Uzbekistan Technical Assistance

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List of Acronyms and Abbreviations

clspm	correct letter sounds per minute
cnwpm	correct nonwords per minute
cwpm	correct words per minute
COVID-19	coronavirus disease 2019
EGMA	Early Grade Math Assessment
EGR	early grade reading
EGRA	Early Grade Reading Assessment
L1, L2	first language, second language
MOPE	Ministry of Public Education
NGO	nongovernmental organization
ORF	oral reading fluency
PCA	principal component analysis
SES	socioeconomic status
TIMSS	Trends in International Mathematics and Science Study
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development

Executive Summary

During November and December 2021, the Ministry of Public Education (MOPE) with the support from the United States Agency for International Development (USAID) conducted a national survey of over 21,000 students in Grades 3 and 5 to assess their foundational reading and math skills. The results showed how well all students could read in Uzbek, and for those learning in other languages, how well they are learning to read in either Russian, Karakalpak, Kazakh, Kyrgyz, Tajik, or Turkmen. The math assessments, conducted in each of the seven languages of instruction, showed how well students understand and apply basic math concepts.

21,294 students
in Grades 3 and 5

935 schools

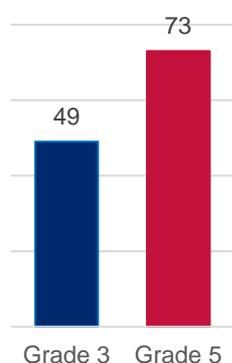
14 Regions

7 languages

Reading in Uzbek

Students in Uzbekistan are acquiring solid foundational reading skills in the first two years of school as reflected in their performance on the early grade reading assessment (EGRA) given shortly after the start of Grade 3.

Exhibit 1: Oral Reading Fluency of Uzbek Students in Uzbek (correct words/minute)



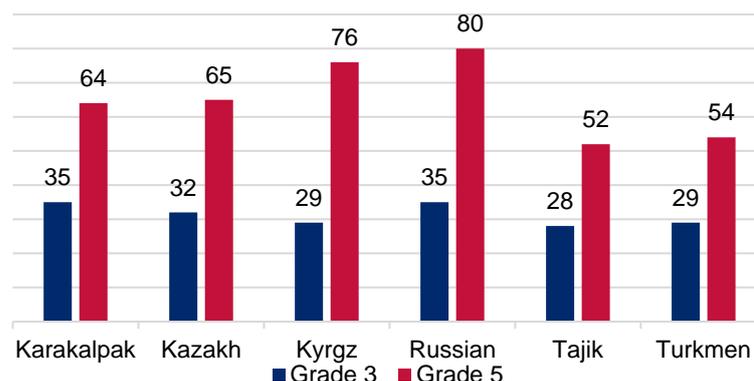
Reading fluency of Uzbek language students in Uzbek is strong and increases appreciably from early in Grade 3 to early in Grade 5 as seen in **Exhibit 1**. Two additional years of schooling on average show a gain of 24 more words correctly read per minute. On average performance in reading across Uzbekistan is consistent, with two exceptions. Students learning in Uzbek in Navoiy on average scored 10 words correct per minute higher than the national average. Those in Andijon scored 11 words per minute lower.

Uzbek language students tested early in Grade 3 are also able to understand well a simple Grade 2 level Uzbek text – 69% were able to meet the standard of answering correctly 80% or more of the comprehension questions. For Grade 5, students were given a longer, more complex text appropriate to Grade 4 to read silently and were asked more comprehension questions. The percentage able to meet the 80% comprehension standard dropped to 47%. This highlights the need to pay greater attention

to strengthening and deepening students’ ability to read and fully understand increasingly complex text as they advance through school.

Students studying in schools or sections using other languages as the mediums of instruction performed lower on Uzbek reading fluency in Grade 3 across all languages. However, as seen in **Exhibit 2**, those learning in Russian and Kyrgyz in fact perform better than their Uzbek peers in Uzbek reading fluency by the time they begin Grade 5. Those studying in Turkmen and Tajik in Grade 5 read

Exhibit 2: Uzbek Oral Reading Fluency of Students Learning Uzbek as a Second Language (correct words/minute)



Uzbek with significantly lower fluency than Uzbek students.

Kyrgyz, Russian, and Tajik students in Grade 3 have levels of Uzbek reading comprehension similar to their Uzbek peers. In Grade 5, as was the case for Uzbek students, a lower percentage of Karakalpak, Russian, Tajik, and Turkmen students achieve the 80% comprehension benchmark when reading more complex text. In contrast, comprehension of Uzbek text by Grade 5 Kyrgyz and Kazakh students does not show this kind of drop off. Whether these kinds of differences in performance across language groups are due to the characteristics of the different languages, difference in the language group populations circumstances, or to variations in pedagogy in their respective classes is an open question worthy of further research.

Reading in Other Languages

Exhibit 3: Fluency and Comprehension Scores and Changes in Scores from Grade 3 to Grade 5

	Fluency		Comprehension	
	Gr 3	Change G3 to G5	Gr 3	Change G3 to G5
Russian	60	+46	64	-6
Tajik	52	+25	59	-17
Kazakh	46	+34	73	-7
Karakalpak	42	+36	70	-8
Kyrgyz	42	+30	67	+6
Turkmen	36	+13	63	-7

Exhibit 3 summarizes oral reading fluency and reading comprehension in each of the six other languages for Grades 3 and 5. The language groups are ranked in order from highest to lowest reading fluency in each language. Grade 5 comprehension average scores are also shown for each language. In addition, the gains (or declines) in average score in both fluency and comprehension are also shown.

Students tested in Russian had the highest reading fluency and the largest gain from Grade 3 to Grade 5. But they

had only modest comprehension and saw a slight decrease in comprehension from Grade 3 to Grade 5. Students tested in Turkmen had the lowest reading fluency and the smallest fluency gain from Grade 3 to Grade 5. Their performance in comprehension was similar to students learning in Russian both in terms of overall level and the decline from Grade 3 to Grade 5. Students learning in Tajik had the lowest comprehension scores and the largest decline across the two grades. Only those learning in Kyrgyz averaged higher comprehension scores in Grade 5 than in Grade 3.

Math in All Languages

All students were assessed in math in the languages being used in their schools or sections as mediums of instruction. Grade 3 students took an orally administered early grade math assessment (EGMA) that evaluated their understanding and skills in seven areas – identifying the larger or smaller of two quantities, filling in a missing number in a sequence, adding, subtracting, and relation and spatial reasoning. On average, the students at the beginning of Grade 3 are mastering foundational math skills. They have a solid understanding of number and operations and can calculate with accuracy. **Exhibit 4** shows average scores for Grade 3 across all skills domains ranked highest to lowest.

Exhibit 4: Average Grade 3 Math Scores

Math skill domain	Average Percent Correct
Quantity comparison	97%
Addition	83%
Subtraction	75%
Word problems	72%
Missing number	98%
Spatial thinking	62%
Relational reasoning	61%

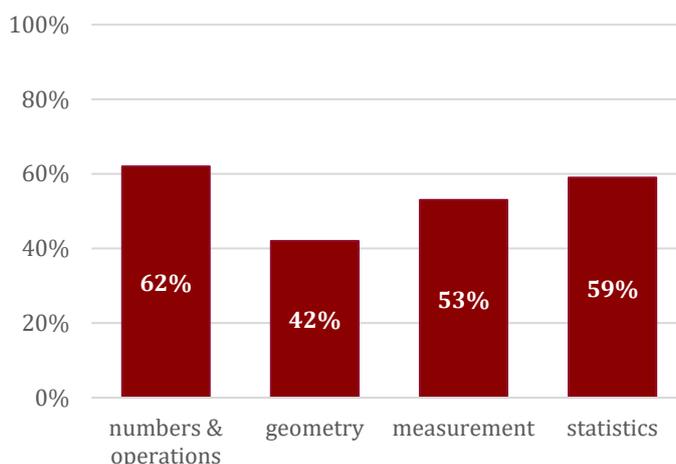
Grade 3 students learning in Turkmen and Karakalpak under-perform on all math skills compared to those learning in the other languages. Math performance among Grade 3 students also did vary somewhat by region. On average, students in the Navoiy region outperformed their peers in the other regions in five of the seven tasks, while students in the Samarqand region underperformed also in five of the seven tasks.

On average students at the beginning of Grade 5 answered correctly only 58% of the total items on the math assessment. They were given a pencil and paper test that contained more complex and diverse problems, asking students to apply their foundational skills to non-routine problems in addition to before basic computations. The assessment covered domains that are common in Grade 5 global standards, including numbers and operations, geometry, measurement, and statistics.

As seen in **Exhibit 5**, students at the beginning of Grade 5, on average, performed best in number and operations, with a majority of students answering basic computation problems correctly and demonstrating an understanding of basic algebraic concepts. Grade 5 students struggled with geometry, on average answering less than half (42%) of those questions correctly.

There were differences in math performance by language group. Overall, students in the Kyrgyz-language group outscored those in other language groups, answering on average 70% of all math items correctly. The performances of students from four other language groups—Uzbek, Karakalpal, Kazakh, and Russian—were very similar on average, but students learning in Tajik and Turkmen answered respectively only 48% and 46% of items correctly. Grade 5 math performance was strongest in Navoiy, weakest in Andijon and Karakalpakstan.

Exhibit 5: Grade 5 Average Percent Correct in Each Skill Domain



Factors Associated with Reading and Math Performance

For both reading and math, absenteeism was associated with lower performance. Twenty-seven percent of students reported missing at least one day of school during the week prior to the test day. Those missing more than one day on average read seven fewer words correctly per minute and scored 10 percentage points lower overall on math compared to those who reported not being absent. This suggests the importance of addressing constraints children may face to regularly attending school as one way to improve learning outcomes.

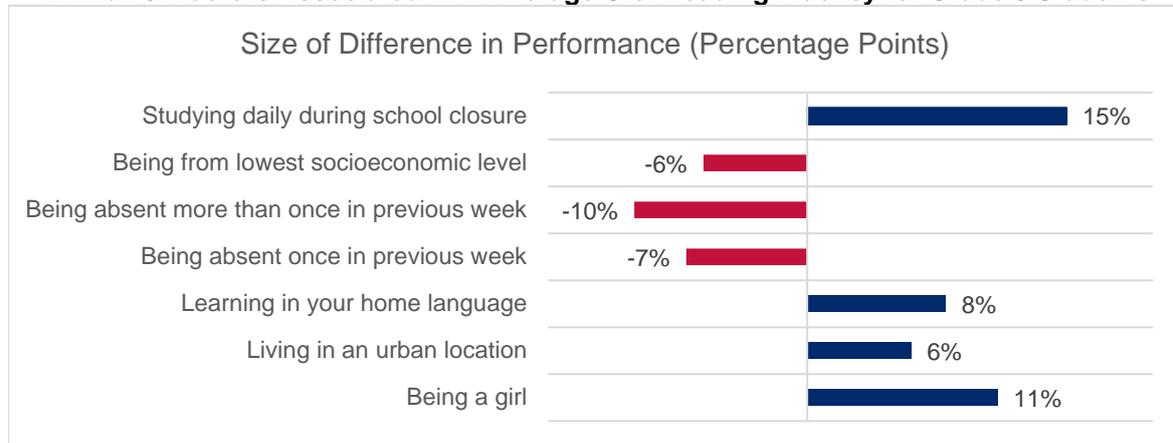
Given that the test was administered after schools had reopened following the pandemic, students were asked about how often and through what means they studied during the time when schools were closed. Grade 5 students who reported studying every day read 10 more words correctly per minute and scored six percentage points higher in math. Those who reported watching lessons on TV (roughly half of all Grade 5 students) fared slightly better in reading and math than those who only studied on their own or with a family member. This indicates that following lessons on TV helped students learn during times when school was closed but raises the question of why some students reported not doing so. Essentially all students reported having a television at home, so it is worth exploring what other reasons may have prevented them from following the lessons that were made available.

Consistent with what is seen across the globe, girls outperform boys in reading fluency, reading eight and ten more words correctly per minute in Grades 3 and 5 respectively. Girls' performance in reading comprehension is similar to that of their male classmates.

Similarly, students from families at the lowest level of socio-economic status slightly underperform in reading and math compared to their peers from better off families.

Exhibit 6 below summarizes some of the positive and negative factors associated with students' performance in reading. It shows the size of the percentage difference associated with each factor in the average Grade 5 oral reading fluency score.

Exhibit 6: Factors Associated with Average Oral Reading Fluency for Grade 5 Students



The results of a similar analysis for math scores showed that students who reported being absent one day the previous week scored 12 percent lower overall. Those absent who reported being absent more than once scored 18 percent lower. Grade 5 students who said that they studied every day during the time when school was closed achieved 10% higher on their overall math score than those who studied less than that.

Conclusion and Recommendations

Reading

Students in Uzbekistan have a solid foundation in letter sound knowledge and decoding skills, both in their first language and even in Uzbek for those in non-Uzbek schools. While students appear to be adequately mastering decoding and early comprehension skills, the data indicates a leveling off or decline in grade-level comprehension skills by Grade 5. Finally, the data suggests that students in Uzbekistan are performing relatively well compared to their peers in neighboring countries.

Recommendations: Continue to support strong letter sound knowledge and decoding skills in the early grades. Ensure that students continue to deepen their comprehension skills as they progress through the grades so that they can increasingly handle more complex texts.

Math

Students are proficient in basic math skills in Grade 3 and 5, but instruction needs to emphasize conceptual understanding and application of these basic skills in new ways. Students at the beginning of Grade 3 have a solid foundation in core math skills such as comparing numbers, identifying patterns in numbers, and adding and subtracting numbers up to 100. These students showed more variation in performance on subtasks that required application of core skills and/or more conceptual knowledge (i.e., word problems, relational

reasoning, and spatial reasoning). On these subtasks, students performed well on initial tasks, but struggled with later tasks that became increasingly complex.

Students at the beginning of Grade 5 answer, on average, slightly more than half of the questions correctly. They showed high proficiency on problems that required calculations across all operations and problems targeting algebraic thinking, suggesting that students had multiple opportunities to develop and perfect these skills in their current curriculum. However, students struggled with tasks that required problem-solving skills and application of basic skills, such as complex word problems and non-routine geometric figures.

Recommendations: Continue to support strong acquisition of proficiency in basic skills in the early grades. Strengthen the support in moving beyond basic skill practice to understanding how a basic skill can be applied to a new situation.

Underperforming Groups

The data reveal that some groups are underperforming compared to their peers. These data can inform initiatives to direct additional support to those who need it.

Language. Students in Tajik-language school consistently underperformed compared to their peers in other language groups, across the board in L1 reading and in L2 reading in Uzbek in Grade 5. That only 10% of Grade 5 Tajik students achieved the benchmark score of 80% or above in silent reading comprehension is very troubling. Some of this may be because of low attendance and low SES. In addition, students in Turkmen-language schools struggled the most with L2 reading in Uzbek.

In math, students in Turkmen-language schools showed the lowest performance on all skills in Grade 3 and most in Grade 5 as well, along with students in Tajik-language schools.

Recommendations: Conduct further research to determine the causes of the relatively poor performance. Direct targeted support to Tajik- and Turkmen-language schools in their respective areas of weakness.

Region. Students in Uzbek-language schools in the Andijon region and in Karakalpakstan consistently had the lowest regional performance in reading in both grades. The same was true for math in Grade 5, though in Grade 3, students in the Samarqand region also struggled compared to their counterparts in other regions.

Recommendations: Conduct further research to determine the causes of the relatively poor performance. Direct targeted support to schools in these regions.

Gender. Consistent with global trends, girls outperformed boys in reading in both grades, except in L2 Uzbek comprehension in Grade 5. While the differences in ORF were substantial (8–10 cwpm), the difference in comprehension was only 1-2 percentage points.

Meanwhile, in math, in Grade 3, girls and boys performed equally well in basic operations, but boys showed a small but statistically significant advantage in application skills. The gap in favor of boys continued in Grade 5, where boys outperformed girls in the overall score by 2 percentage points. In some subskills (number and operations, and measurement) the difference in scores was statistically significant, but not in others (geometry and statistics).

Recommendation: Both boys and girls can succeed at reading and at math. While the data does not explain the differences in performance, they may partly be due to social norms and expectations. Teachers can take steps to promote the love of and confidence in reading and math among students of all genders, while giving extra encouragement and support to those who underperform.

Socioeconomic Status (SES). The survey had some surprising results regarding SES. In most country contexts, being in the lowest SES group is associated with poorer learning outcomes. On the one hand, the analysis showed that not being in the bottom 10% SES was associated with an advantage of 3.9 cwpm in ORF, and a 2.9 percentage point increase in

overall math score in Grade 5. On the other hand, while SES was associated with statistically significant differences in performance in ORF, there was no difference between the top and bottom quartile in performance in Grade 5 comprehension. In addition, some groups with relatively low SES, such as the Kyrgyz-language school students, performed exceptionally well compared to their peers with higher SES averages. Therefore, the SES variable did not behave consistently in the expected direction.

Recommendation: Continue to allocate resources as equitably as possible to all schools, ensuring that students with lower SES have access to the same resources and opportunities as those with more means.

Factors Associated with Higher Performance

Absenteeism appears to be a significant problem, with on average 26% of students reporting having been absent one or more days in the previous week. This problem was especially high in Kyrgyz-, Tajik-, and Turkmen-language schools, as well as in the Andijon region. Since the COVID-19 pandemic was ongoing at the time of the assessment, it may have contributed to higher absenteeism. Not surprisingly, students who were absent more performed worse on average, both in reading and in math.

Recommendation: Conduct contextualized research to define the obstacles to attendance, especially in schools with high absenteeism rates. Undertake contextually targeted measures to improve and support student attendance.

Support during school closures. When schools were closed, studying, and doing homework was associated with improved outcomes in reading but not in math.

Recommendation: Continue to explore better ways to support students during school closures.

School-home language match. Except for students in Russian-language schools, most students are learning at school in the same language they speak at home, and this is an advantage for them in their performance.

Recommendation: Continue to support universal access to instruction in the home language.

Additional Areas for Further Research

In addition to the areas for further research highlighted above, other areas for potential exploration include the following.

- Why did the Kyrgyz students (especially Grade 5) perform so well despite factors otherwise associated with low performance (i.e., high absenteeism, rural residence, and low SES)?
- Why were there statistically significant differences in ORF performance by SES, but not at all in either comprehension task in either grade?
- How do the instruction and materials that students use (for example, their textbooks) differ across the language schools, and in what ways does this link to patterns found in this study (e.g., Kyrgyz-speaking students scoring significantly higher in Grade 5 math)?
- How are students thinking about application problems? What are the gaps in their understandings, in terms of conceptual knowledge?

In conclusion, the results contain a lot of good news, and the MOPE, school personnel, teachers, and students of Uzbekistan are to be commended for their collective efforts toward achieving high learning outcomes. Nonetheless, the data reveal some areas to target for strengthening as the nation continues to strive to build a quality and equitable education system for all students.

1 Introduction

Upon the request of the Ministry of Public Education (MOPE) of the Republic of Uzbekistan, the U.S. Agency for International Development (USAID) supported the Uzbekistan National Early Grade Reading and Mathematics Assessment under the All Children Reading–Asia (ACR–Asia) task order. ACR–Asia directly contributes to the education goal to improve early grade reading (EGR) skills for 100 million children worldwide. To achieve this goal, ACR–Asia provides technical, logistical, and implementation services to USAID Missions in Asia. ACR–Asia also builds capacity and leadership of key education stakeholders from governmental and nongovernmental organizations (NGOs) to implement evidence-based, high-impact EGR programs.

While student enrollment rates in Uzbekistan are generally high, previous studies have revealed that learning outcomes have room for improvement.¹ A 2018 study by the United Nations Children’s Fund (UNICEF) and the MOPE assessed over 7,000 Grade 4 students in 268 schools and found that students generally did well at understanding explicit information in texts but were less adept at processing more complex information, making inferences, or evaluating content.² Similarly, in mathematics students handled straightforward computations well but struggled with complex problems. Performance also varied widely from school to school.

To support the MOPE’s efforts toward a more effective basic education system, USAID provided collaborative technical assistance in the administration of a national survey in reading and mathematics using the Early Grade Reading Assessment (EGRA) and Early Grade Math Assessment (EGMA). This survey will provide the MOPE relevant data on student learning outcomes in core skill areas.

In preparation for the national assessment, the ACR–Asia team conducted a pilot assessment in November 2019. The objectives of the pilot were to train assessors on EGRA/EGMA protocols; build capacity of the MOPE in test administration; test the reliability and validity of the instruments; and document revisions needed before the full-scale assessment. The national assessment was to follow soon thereafter in the Spring of 2020, but the coronavirus disease 2019 (COVID-19) pandemic made that impossible.

In November 2021, a national survey was conducted with over 21,000 students in Grades 3 and 5 across Uzbekistan. Reading performance was measured for all languages of instruction based on the language of instruction used in the school (Uzbek, Russian, Karakalpak, Kazakh, Kyrgyz, Tajik, or Turkmen). In addition, students attending non-Uzbek-language schools were also assessed in Uzbek as a second language. The sample includes 935 schools and allows for results to be disaggregated by region, urbanicity, and gender.

2 Study Design

2.1 Purpose of the Study

The purpose of the National EGRA/EGMA was to provide evidence of the current performance in reading and mathematics of students in Uzbekistan, to inform ongoing education reform processes. EGR and mathematics skills are the foundation for future

¹ World Bank. *Uzbekistan Education Sector Analysis*. Washington, DC: World Bank, 2018. <https://documents1.worldbank.org/curated/en/379211551844192053/pdf/Uzbekistan-Education-Sector-Analysis.pdf>.

² Deepa Sankar. “Student Learning at Primary Grades in Uzbekistan: Outcomes, Challenges, and Opportunities: A Summary of Uzbekistan National Learning Achievement Study, Grade IV, 2018.” UNICEF, July 2019. <https://www.unicef.org/uzbekistan/media/3316/file/National%20Learning%20Achievement%20study%20summary.pdf>.

learning, and the results of this data analysis can help educators understand how well students are doing in these foundational skills. The results will also provide information that will be important for curricula reform and instruction and support the development of grade-level benchmarks. Unlike previous studies, this assessment was national in scale and assessed students in all languages used for instruction in schools.

2.2 Research Questions and Design

This activity sought to answer the following research questions:

1. How well are students in Uzbekistan learning to read in general after having completed 2 and 4 years of schooling, and which factors are associated with better learning outcomes?
2. How well do students in Uzbek-language schools read Uzbek after having completed 2 and 4 years of schooling?
3. How well do students in non-Uzbek languages read in the non-Uzbek language (i.e., Russian, Karakalpak, Kazakh, Kyrgyz, Tajik, or Turkmen) after having completed 2 and 4 years of schooling?
4. How well do students in non-Uzbek-language schools read Uzbek after having completed 2 and 4 years of schooling?
5. How well are students who have completed 2 and 4 years of schooling able to do grade-level mathematics in their main language of instruction?

The assessments used to answer the research questions were designed for students at the end of their Grade 2 and Grade 4 school years. As mentioned earlier, the national survey was originally scheduled for May 2020, at the end of the 2019–2020 school year. However, due to the global COVID-19 pandemic, the survey had to be postponed. The survey was ultimately administered in November and December 2021. Because these months represented the beginning of the school year, instead of the end, the decision was made to administer it to students in Grade 3 and Grade 5 to capture learning of students who had completed 2 and 4 years of schooling.

The assessment tasks were designed to measure developmentally appropriate reading and math skills at each grade level.

EGRA Tasks

The goal of learning to read is the ability to construct meaning from written text, or comprehension. Comprehension is a complex skill or a composite behavior³ made possible from the mastery and simultaneous use of a wide array of subskills. EGRA measures both lower order and higher order reading skills, including the following.

Letter sound knowledge and decoding are some of the earliest skills in learning to read. Children learn the speech sounds associated with each letter of the alphabet and then apply this knowledge to decode (or “sound out”) new words. In the **Letter Sound Identification** task (**Figure**), the students were presented with a grid of 100 letters⁴ in random order and asked to say out loud the sound that each letter represents. The **Nonword Decoding** task presented students with a grid of 50 nonsensical or pseudowords (nonwords) in random

³ RAND Reading Study Group, Cathy Snow, and Office of Educational Research and Improvement. Reading for Understanding toward an R & D Program in Reading Comprehension. Santa Monica, Calif.: Rand Science and Technology Policy Institute, 2002.

⁴ While the languages in this study can be written in different scripts, the script used for the assessment was the one officially sanctioned for each language in the school system. That is, the Uzbek, Karakalpak, and Turkmen assessments used Latin script, and the Kyrgyz, Kazakh, Russian, and Tajik assessments used Cyrillic script.

order. Nonwords are constructed from legitimate sound and spelling combinations in the target language but are not actual words; they are used to test the student’s ability to apply letter sound knowledge to decode new words that they have never seen before.

Over time, strong decoding skills and multiple exposures lead to automatic word recognition manifested by fluent reading. **Fluency** is often defined as the ability to read with speed, accuracy, and understanding. Fluency is critical for comprehension, as rapid, effortless word recognition processes enable the reader to focus on the meaning of the text rather than on decoding words letter by letter.⁵ In the **Oral Reading Fluency task**, Grade 3 students were given up to 3 minutes to read aloud a Grade 2 level passage approximately 60 words long, and Grade 5 students were given up to one minute to read a Grade 4 level passage approximately 110 words long.

Reading comprehension is the goal of reading and refers to the ability to actively engage with and construct meaning from written text. In the **Oral Reading Comprehension task**, immediately after the student read the text for the Oral Reading Fluency task, the assessor removed the text and orally posed five questions based on the text, and the student answered each one orally. Four of the questions were direct and one was inferential. In the **Silent Reading Comprehension task**, students were given up to 4 minutes to read silently a Grade 4 level text approximately 180 words long (133 in Uzbek as a second language). Afterwards, the assessor orally posed 10 questions based on the text (8 direct, 2 inferential), and the student responded orally. The assessor did not remove the text from the student during the questioning, and the student was allowed to refer to the text if desired. Assessors were trained to accept a range of correct answers. Compared to the oral reading comprehension task, the silent reading comprehension task was based on a higher-level passage (Grade 4 level versus Grade 2) that required the ability to process more complex semantic and syntactic relationships among text elements, as well as to read closely and retrieve details within a lengthier text. The task was purposefully constructed this way under the expectation that students in the upper grades should be able to comprehend longer, more complex text.

Students were all assessed in the language of instruction of their school, which was, for the majority, their home language or “first language” (L1).⁶ In addition, students’ learning in languages other than Uzbek were also assessed in Uzbek as a second language (L2).

The higher order skills of fluency and comprehension build on lower order skills of letter sound knowledge and decoding. The lower order skills have been shown to be predictive of later reading achievement. Therefore, even if children cannot yet read a passage with comprehension, EGRA can nonetheless measure their progress toward acquiring the lower order skills that are steps along the path to that end.

Figure 1. The Letter Sound Identification Task in Uzbek

	а	М	и							
d	K	i	z	o	L	s	ng	L	o	
N	B	а	Y	M	K	b	R	A	E	
u	Y	q	L	b	Z	Q	а	B	U	
Sh	x	i	k	j	G	A	i	N	v	
r	o'	A	O	H	L	N	p	U	i	
A	i	n	h	O	e	i	а	n	f	
O'	m	i	Q	T	n	h	O	T	A	
L	y	G	N	D	A	o	A	i	s	
Ng	H	O	i	t	g	а	d	S	g'	
D	R	M	а	R	i	S	g	r	sh	

⁵ National Reading Panel (U.S.), National Institute of Child Health and Human Development (U.S.). Report of the National Reading Panel: Teaching Children to Read: An Evidence-Based Assessment of the Scientific Research Literature on Reading and Its Implications for Reading Instruction: Reports of the Subgroups. Washington, D.C.: National Institute of Child Health and Human Development, National Institutes of Health, 2000.

⁶ For the most part, the students’ school language of instruction matched their home language and will be generally referred to in this report as the L1. However, for a minority of students in each language group, and, exceptionally, a majority in the Russian language schools, the language of instruction at school did not match their home language and is not a true L1.

EGMA Tasks

EGMA tasks are designed to measure skills that are predictive of future academic success and proficiency in mathematics (**Figure 2**). Importantly, the skills measured are ones that can be improved through classroom instruction and meet international standards of mathematics. Items on each task become progressively more difficult.

Grade 3 Math

The **Quantitative Comparison** task assessed children's place-value knowledge and understanding of numerical magnitude. The task presented 10 pairs of number and students compared the numbers and determined which was larger. Items in the task began with single-digit numbers and ended with three-digit numbers.

The **Missing Number** task assessed children's ability to detect number patterns, a skill that is foundational to developing algebraic thinking. For this task, students identified the missing number in 10 number patterns.

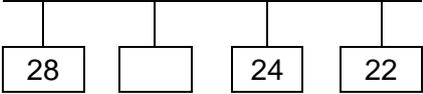
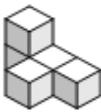
The **Addition and Subtraction** tasks included five items each. Students were asked to solve addition and subtraction problems with one- and two-digit numbers.

The **Word Problems** task included six problems, each presented as a story or situation read aloud to the child. This format required children to first make sense of the situation (problem) and then make and execute a plan to produce the answer/response.

The **Relational Reasoning** task contained five items. It measured how well a child was able to use the relationships between numbers and/or expressions to solve problems.

The **Spatial Thinking** task contained five items. It measured students' ability to manipulate objects in three dimensions.

Figure 2. Examples of Grade 3 Math Items

Domain	No. of Items	Example
Quantitative Comparison	10	Which is greater? 623 632
Missing Number	10	
Addition	5	$38 + 26 =$
Subtraction	5	$59 - 37 =$
Word Problem	6	There are 6 children in the class. 2 are boys. The rest are girls. How many girls are in the class?
Relational Reasoning	5	$28 = \square + 20 + 6$
Spatial Thinking	5	 Look at this object. Can you tell me how many cubes were used to make the object?

Grade 5 Math

The Grade 5 math assessment was a group-administered, written assessment. It measured skills in several math domains aligned to the fourth grade Trends in International Mathematics and Science Study (TIMSS) Framework, a global mathematics assessment administered in Grades 4 and 8 (Figure 3).

Number and Operations included place value, number patterns, addition, subtraction, multiplication, division expressions and word problems, comparing and ordering, fractions, and problems requiring algebraic thinking.

Geometry covered two- and three-dimensional shapes and other geometric figures.

Measurement included volume, area, time, and estimation of measurement units.

Statistics items asked students to read graphs and answer questions based on the information given.

Items were either multiple choice or open answer. There were 31 items total on the assessment.

Table provides an overview of the EGRA and EGMA tasks administered by grade.

Figure 3. Examples of Grade 5 Math Items

Domain	No. of Items	Example
Number and Operations	18	<p>Bo'sh katakka to'g'ri keladigan sonni yozing.</p>
Geometry	5	<p>Parallelepipedga qarang. Uning nechta qirrasini bor?</p>
Measurement	4	<p>Tomonlari 9 cm va 15 cm bo'lgan to'rtburchakning yuzasini toping.</p>
Statistics	4	<p>Diagrammadan foydalanib, savollarga javob bering.</p> <p>3- va 4-sinf o'quvchilari qatnashgan sport turlari</p> <p>3-sinf o'quvchilarining nechitasi voleybolga qatnashadi?</p>

Table 1. Overview of EGRA/EGMA Subtasks by Grade

Language	EGRA	
	Grade 3	Grade 5
Assessed in L1	Letter Sound Identification Nonword Decoding Oral Reading Fluency (Grade 2 level text) Oral Reading Comprehension (Grade 2 level text)	Nonword Decoding Oral Reading Fluency (Grade 4 level text) Silent Reading Comprehension (Grade 4 level text)
Assessed in L2 (Uzbek)	Nonword Decoding Oral Reading Fluency (Grade 2 level text)	Oral Reading Fluency (Grade 4 level text) Silent Reading Comprehension (Grade 4 level text)

Oral Reading Comprehension (Grade 2 level text)		
EGMA		
Language	Grade 3	Grade 5
Instructions given in language of instruction	Quantity Discrimination Missing Number Addition/Subtraction Word Problems Relational Reasoning Spatial Structuring 3D	Numbers and Operations Geometry Measurement Statistics

2.3 Pilot

The assessments were adapted collaboratively with the MOPE during a workshop in October 2019. The assessment tasks were aligned with expected grade-level competencies. In November 2019, 21 MOPE staff and Methodists were trained on EGRA/EGMA survey administration. Following the training, teams deployed to administer the survey in 70 pilot schools in 6 provinces. The Pilot Study Report was submitted January 2020 and outlined recommendations to improve the instruments and training in preparation for the national survey.

2.4 National Survey Data Collection Timeline

For the national survey, 20 master trainers were trained November 1–5, 2021 on the administration of the EGRA/EGMA; these trainers subsequently went on to train 218 assessors between November 8–12, 2021. At the end of the training, 183 of the 218 (84%) participants scored at least 90% or above on the final Assessor Accuracy Measure. The data collection for the national survey took place between November 15 and December 14, 2021. During that time, the assessors visited the sampled schools in teams of four persons, with the trainers acting as field coordinators, supporting the assessor teams.

2.5 Sample Design

Uzbekistan is divided into 12 regions, one autonomous republic (i.e., the Republic of Karakalpakstan), and one independent city (i.e., Tashkent share). The regions vary in population size, urbanicity, and ethnic and linguistic composition, as well as in school enrollment rates and learning outcomes. To be regionally as well as nationally representative, the national survey included a sample of approximately

50 Uzbek-language schools per region, for a total of 700 schools (**Table**). In addition, up to 50 schools with one of six non-Uzbek languages of instruction were also sampled in the regions with concentrations of speakers of each given language, adding 235 schools, for a grand total of 935. **Annex A** describes the sampling methodology in detail.

Figure 4. Map of Uzbekistan



Table 2. Number of Schools Surveyed by Region and Language of Instruction

Region	School Language of Instruction							Total
	Uzbek	Kyrgyz	Karakalpak	Kazakh	Russian	Tajik	Turkmen	
Andijon	50	11	0	0	3	0	0	64
Buxoro (Bukhara)	50	0	0	0	1	0	0	51
Farg'ona (Fergana)	50	2	0	0	2	0	0	54
Jizzax (Jizzakh)	50	9	0	0	1	0	0	60
Namangan	53	0	0	0	2	0	0	55
Navoiy	50	0	0	10	2	1	0	63
Qashqadaryo	50	0	0	0	2	13	0	65
Republic of Karakalpakstan	50	0	50	22	4	0	17	143
Samarqand	50	0	0	0	4	7	0	61
Sirdaryo	50	0	0	0	0	0	0	50
Surxondaryo	49	0	0	0	1	11	0	61
Tashkent independent city	49	0	0	0	21	0	0	70
Tashkent	50	5	0	18	5	8	0	86
Xorazm	49	0	0	0	2	0	1	52
Total	700	27	50	50	50	40	18	935

In each school, 12 students (6 boys and 6 girls) in Grade 3 and another 12 in Grade 5 were randomly selected for participation. Overall, 21,294 students were assessed, of whom 49.9% were girls. **Table** shows how the sample is weighted by school language to reflect the population. See also **Table A-3** in **Annex A** for the raw and weight counts of schools and students assessed by grade level, language, and region.

Table 3. Weighted Sample by School Language of Instruction

Language	Percentage of Grade 3 students	Percentage of Grade 5 students	Percentage of Combined Grade 3+5
Uzbek	86.7	88.6	87.7
Kyrgyz	0.1	0.1	0.1
Karakalpak	1.8	1.9	1.9
Kazakh	0.6	0.6	0.6
Russian	10.3	8.4	9.3
Tajik	0.5	0.4	0.4
Turkmen	0.1	0.1	0.1
Total	100	100	100

Table highlights key student demographic characteristics, overall and by region. On average, only 6% of students were over-age for their grade.⁷ The Buxoro region was an outlier in this regard, with 28% of students being over-age. In contrast, absenteeism was high across the board. On average, more than a fourth (26%) of students reported having missed one or more days of school during the week prior to the survey. The absenteeism rate was lowest in Navoiy region (15%) and highest in the Andijon region (33%).

Overall, a strong majority (88%) of students reported speaking the school language of instruction at home. By region, this percentage varied from a low of 68% in Tashkent City, to a high of 96% in the Jizzax and Qashqadaryo regions.

A little over a third (37%) of schools in the overall sample were classified as urban; this too varied considerably by region. In addition, data were collected during the student interview to build a measure of socioeconomic status. A socioeconomic index was derived for each student using a principal component analysis of household items, student self-reported.

Annex B contains more information about the socioeconomic wealth index score. While the socioeconomic status (SES) profiles varied somewhat by region, the students in Tashkent City were strongly over-represented in the top SES quartile.

Table 4. Key Student Demographics, by Region

Region	Percentage of Sample	Percentage Over-age	Percentage Absent 1 or More Days in Previous Week	Percentage Speak School Language at Home	Percentage Urban	Percentage in Bottom SES Quartile	Percentage in Top SES Quartile
Overall	100	6.3	26.4	87.8	37.4	24.1	26.2
Andijon	9.3	2.4	32.8	94.5	26.7	32.0	24.7
Buxoro (Bukhara)	5.2	28.1	23.7	73.3	30.6	16.2	24.6
Farg'ona (Fergana)	9.9	3.7	26.0	93.1	32.7	26.5	25.7
Jizzax (Jizzakh)	4.2	1.5	24.7	95.5	32.9	25.3	25.2
Namangan	8.1	4.1	26.4	89.8	41.0	29.2	22.3
Navoiy	3.0	6.6	15.2	86.4	46.7	12.8	36.2
Qashqadaryo	10.3	7.1	26.2	95.6	28.3	28.1	10.1

⁷ Over-age was defined as older than 9 for students in the beginning of Grade 3 and older than 11 for students in the beginning of Grade 5.

Table 4. Key Student Demographics, by Region

Region	Percentage of Sample	Percentage Over-age	Percentage Absent 1 or More Days in Previous Week	Percentage Speak School Language at Home	Percentage Urban	Percentage in Bottom SES Quartile	Percentage in Top SES Quartile
Republic of Karakalpakstan	5.3	7.9	27.2	79.3	52.4	19.6	28.1
Samarqand	12.1	7.9	29.8	84.7	27.1	29.0	24.9
Sirdaryo	2.5	1.0	28.3	93.8	30.0	32.5	25.1
Surxondaryo	8.2	4.7	25.1	91.2	19.7	31.3	16.9
Tashkent independent city	7.9	1.4	25.3	67.6	100	5.2	60.3
Tashkent	8.3	1.0	23.1	88.5	39.6	20.8	26.4
Xorazm	5.8	15.9	25.9	93.0	25.2	14.8	27.7

3 Findings

3.1 How Well Are Children Learning to Read in Uzbekistan in General, and Which Factors Are Associated with Better Learning Outcomes?

The data reveal the following general trends across language groups and regions:

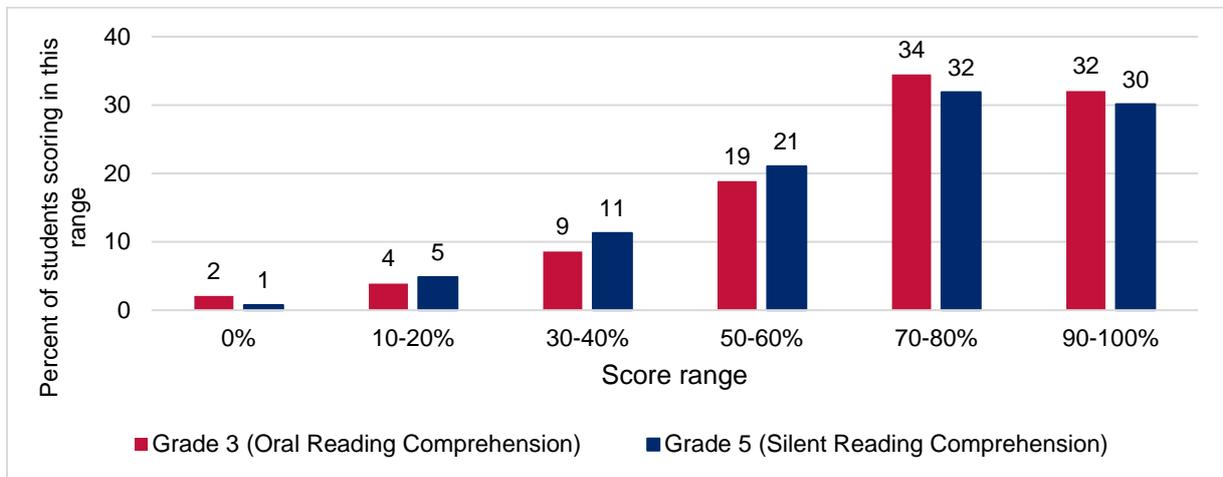
At the beginning of Grade 3, students demonstrated strong alphabet knowledge in their first language (L1). On average, students were able to name 60–95 letter sounds per second, depending on the L1; even the lowest rate was equivalent to one letter sound per second.

While there is no universal benchmark for decoding and word recognition fluency due to inherent linguistic and orthographic differences from one language to the next, the students' performance on the nonword decoding and oral reading fluency (ORF) tasks showed a reasonable foundation by the beginning of Grade 3 and a consistently upward trend from beginning of Grade 3 to beginning of Grade 5; in some cases, the increase between grades was dramatic. Regarding ORF in Uzbek, not surprisingly, the Grade 3 students in Uzbek-language schools outperformed their counterparts who were learning Uzbek as a second language (L2) (often in a different script from their L1), but by the beginning of Grade 5 the L2 students had made significant progress in closing the gap, sometimes by more than doubling the mean Grade 3 ORF from their respective groups.

For comprehension, overall, the Grade 3 students correctly answered on average 75% of the five questions on the oral reading passage, and just over half of the students (57%) scored 80% or higher. By comparison, the Grade 5 students correctly answered on average 69% of the 10 questions on the silent reading passage, and just under half of them (47%) scored 80% or higher. Interpreting the trajectory of comprehension between grades is less straightforward than for ORF because of the differences in the comprehension tasks between the grades. As a reminder, the Grade 3 task consisted of five questions based on short passage (averaging around 60 words long) that the student read aloud. The Grade 5 passage was on average three times longer (180 words); the student read it silently and then answered 10 questions. In six of the seven language groups, including the one with the largest sample size, Uzbek, the mean score on the Grade 5 silent reading comprehension task was lower than that of the Grade 3 oral reading comprehension task, though for three of the language groups (Kazakh, Russian, and Turkmen), the difference was within the margin

of error. The exception was the Kyrgyz-language group, where the Grade 5 students outperformed their Grade 3 counterparts in comprehension by a significant margin. Except for the Kyrgyz group, the reading comprehension data suggest a leveling off or possible decline in grade-level comprehension skills over time. A comparison of the distribution of scores in each grade shows a slight consolidation toward the middle in the Grade 5 data compared to Grade 3 (Figure). For more detail, see the distributions of the reading fluency and comprehension scores for each language group in Annex C.

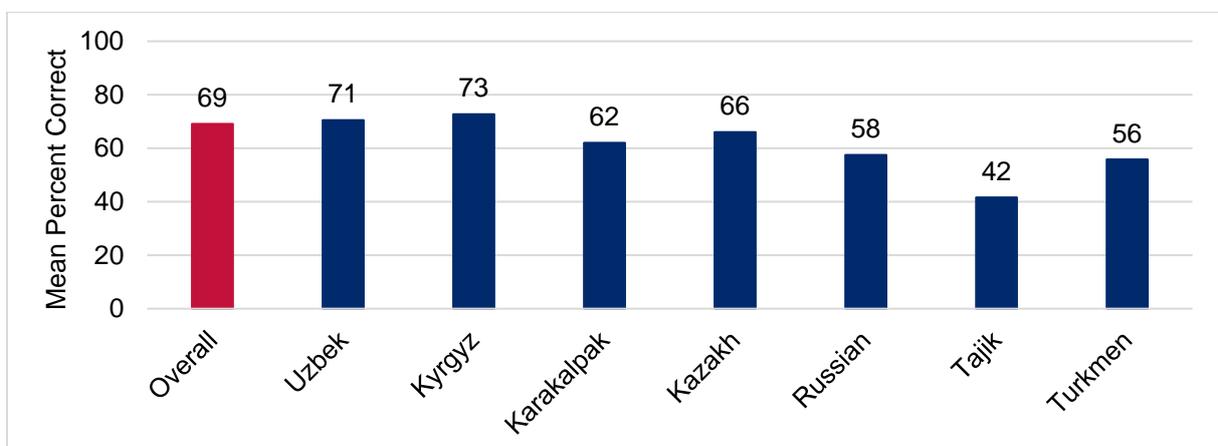
Figure 5. Distribution of Scores in Reading Comprehension in the Language of Instruction



Variation in Student Performance

Language. Despite these general trends, reading performance varied somewhat by language group, as shown in the tables below. For the reading comprehension tasks, all language groups read the same content and answered the same questions, though in their respective first languages (L1). In Grade 5, L1 silent reading comprehension was strongest in the Kyrgyz- and Uzbek-language schools, and weakest, by a substantial margin, in the Tajik-language schools (Figure).

Figure 6. Grade 5 Silent Reading Comprehension Means in the Language of Instruction, Overall and by Language Group



Another way to look at the reading comprehension data is to look at the percentage of students who scored 80% or higher on the comprehension task. This is a common benchmark as it is the equivalent of answering a strong majority of questions correctly, that is, at least 4 out of 5, or 8 out of 10. In the overall sample, close to half (47%) of the Grade 5 students were able to meet this benchmark, but this average was driven largely by the Uzbek-language schools. Except for the Kyrgyz-language school students, students in all the other language groups met this benchmark at lower rates, including only 10% of the Tajik-language school students (**Figure 7**).

Figure 7. Percent of Grade 5 Students Achieving at least 80% on Silent Reading Comprehension in the Language of Instruction, Overall and by Language Group

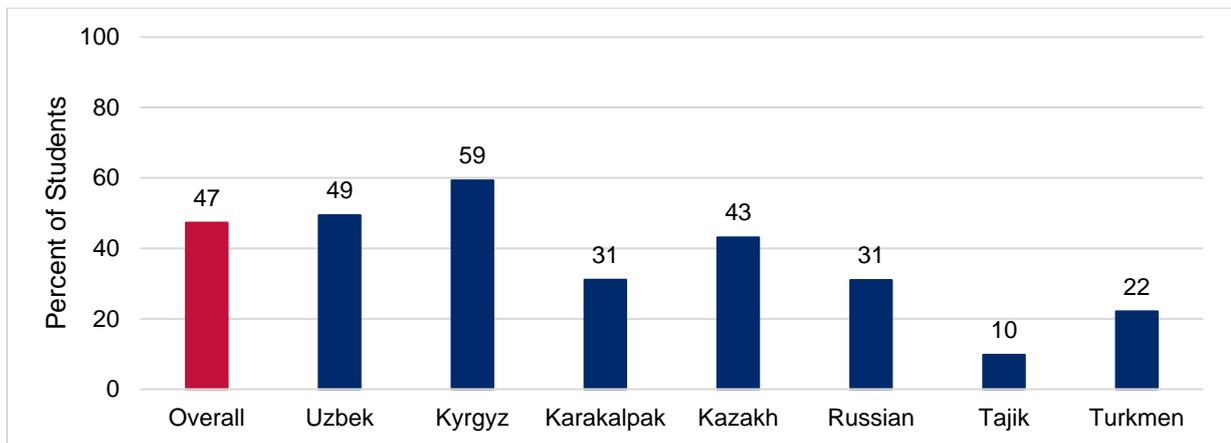
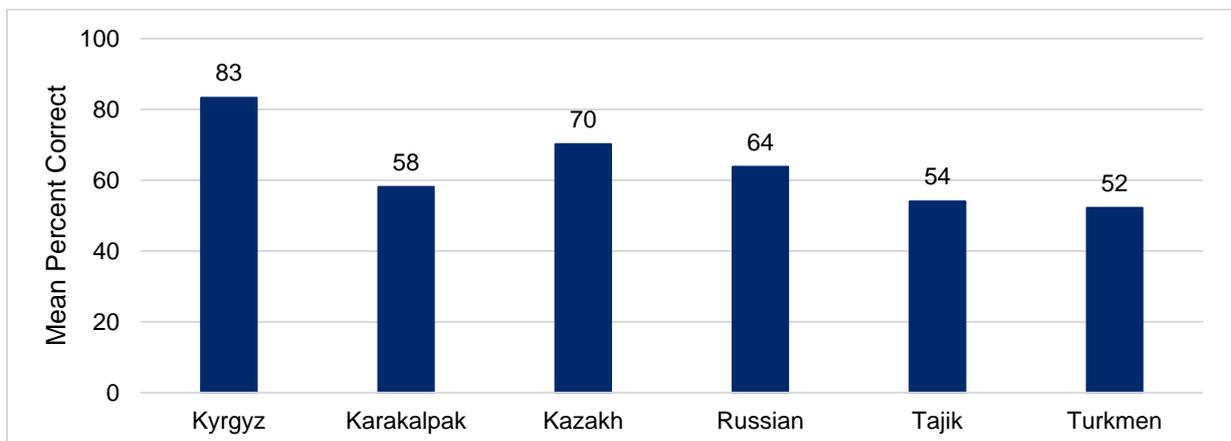


Figure 7 compares the Grade 5 silent reading comprehension in Uzbek as a second language across language groups. The Uzbek L1 language group received a different, longer passage than did the other groups, who were reading Uzbek as a second language, so their scores are not directly comparable. However, the L2 Uzbek reading task was the same for all the other language groups. Similar to their performance in L1, the Kyrgyz group showed the strongest performance, with students from Tajik- and Turkmen-language schools on the lower end.

Figure 8. Grade 5 Silent Reading Comprehension Means in Uzbek as a Second Language, by Language Group



In addition, reading performance was related to other variables in the following ways.

Gender. Consistent with global trends, girls outperformed boys at statistically significant levels ($p < 0.05$) in most reading tasks in both L1 and L2, and in both grades. For example, in Grade 3, girls read 8 more correct words per minute (cwpm) than did boys in Grade 3 ($p < 0.001$) and 10 more in Grade 5 ($p < 0.001$). However, their advantage in comprehension was very small, though statistically significant—just one percentage point in Grade 3 ($p = 0.023$) and two percentage points in Grade 5 ($p < 0.001$). In L2 Uzbek, there was a 5-percentage point gap in favor of girls in comprehension in Grade 3 ($p = 0.039$) but no difference in Grade 5.

Urbanicity. The urbanicity of the school showed an inconsistent relationship with performance. In the first language, students in rural schools outperformed urban schools in letter sounds, oral reading comprehension, and silent reading comprehension, and the difference was statistically significant. In Grade 3, differences in the mean scores in the L2 Uzbek tasks were not statistically significant, but in Grade 5, students in urban schools had a higher mean ORF in L2 Uzbek than did their rural counterparts (78 cwpm compared to 66 cwpm) and the difference was statistically significant.

Socioeconomic Status. Students in the highest socioeconomic status (SES) quartile outperformed their counterparts in the lowest SES quartile by 8–12 cwpm on the L1 ORF tasks (**Table**). However, the two groups showed no difference in their L1 comprehension scores in either grade.

Table 5. Reading Performance in the Language of Instruction by Socioeconomic Status Quartile

Skill		Mean Score [95% confidence interval]	
		Lowest SES Quartile	Highest SES Quartile
Fluency	Grade 3 ORF (cwpm)	46.0 [±1.4]	54.6 [±1.8]
	Grade 5 ORF (cwpm)	70.4 [±2.0]	81.5 [±1.7]
Comprehension	Grade 3 Oral Reading Comprehension (% correct of 5 questions)	74.5 [±1.5]	74.4 [±1.7]
	Grade 5 Silent Reading Comprehension (% correct of 10 questions)	68.8 [±1.3]	68.7 [±1.5]

Factors Associated with Higher Learning Outcomes in Reading

Regression models were used to investigate factors associated with higher learning outcomes in reading, as measured by ORF. After controlling for basic student demographic characteristics (gender, over-age, urban/rural, SES, language of assessment, and whether the student speaks that language at home) several variables showed statistically significant correlations with reading performance (**see Annex D**). The factors associated with higher reading outcomes included attendance, studying during school closures, urbanicity of the school location, gender (female), studying in the same language as the one spoken at home (i.e., school-home language match), and SES. For example, Grade 5 students who reported being absent more than once the previous week read on average 6.8 fewer cwpm on the ORF task than those who were not absent, while students who reported studying every day during school closures read on average 10.4 more cwpm than those who did not study.

Student Reading Performance in Uzbek-Language Schools

The largest sample of students came from Uzbek-language schools. For this reason, the averages in the Uzbek sample are close to those of the overall sample.

How well are students in Uzbek-language schools learning to read in Uzbek at the beginning of Grade 3 and Grade 5?

	Student Characteristics	
	Grade 3	Grade 5
Number of students assessed	8,034	8,059
% Over-age	8.4	5.1
% Absent one or more days the previous week	27.6	25.5
% Speak Uzbek at home		93.6
% Urban		31.2
% In lowest SES quartile		26.0
% In highest SES quartile		22.1

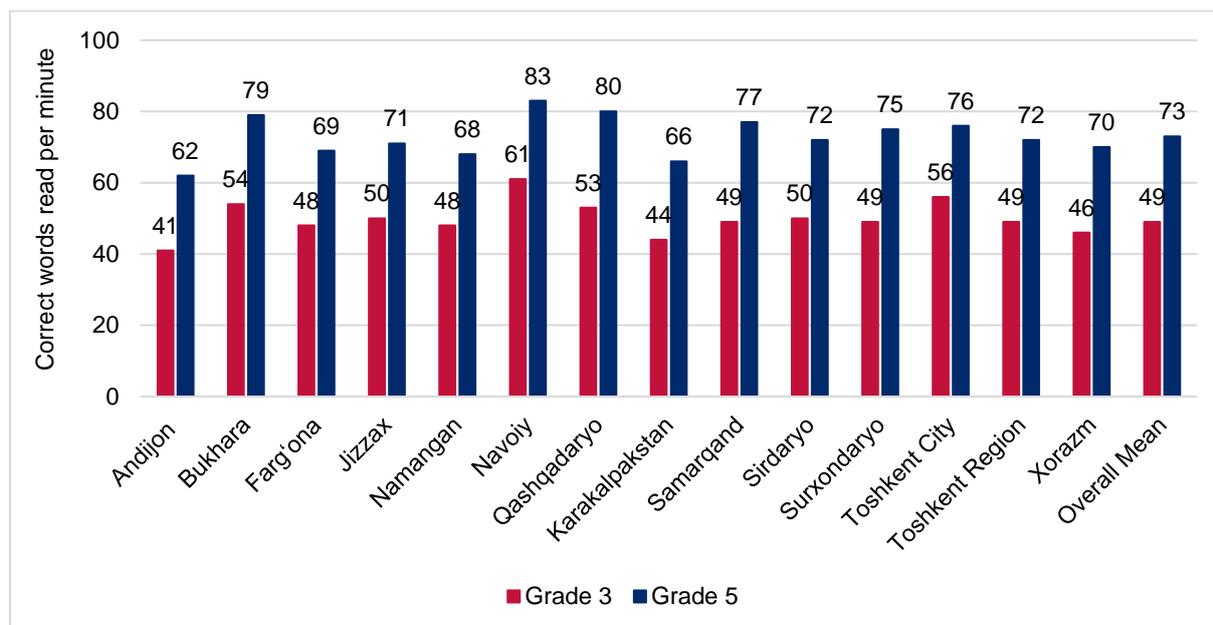
As shown in **Table 6**, overall, students in Uzbek-language schools showed good foundational reading skills with strong letter sound knowledge at the beginning of Grade 3. Nonword decoding and ORF rates increased from Grade 3 to the beginning of Grade 5, with consistently high (and increasing) accuracy in both tasks. In particular, the mean ORF rate increased by 24 cwpm from Grade 3 to Grade 5, an increase of 48% over Grade 3. Grade 3 students averaged 77% correct on the oral reading comprehension task, with 69% of students scoring 80% or higher. This constituted the strongest Grade 3 performance in comprehension across the language groups. Average comprehension was slightly lower (71%) on the silent reading task in Grade 5, possibly due to the longer passage and higher level of comprehension skills required, with just under half of the students scoring 80% or higher.

Table 6. Reading Performance in Uzbek in Uzbek-Language Schools, by Skill and Grade

Skill	Mean Scores	
	[95% confidence interval]	
	Grade 3 (n = 8034)	Grade 5 (n = 8059)
Letter Sound Identification (correct letter sound per minute [clsprn])	89.0 [±0.9]	-
Nonword Reading (correct nonword per minute [cnwpm])	39.3 [±0.6]	49.0 [±0.7]
ORF (cwpm)	49.0 [±0.9]	72.7 [±1.1]
Oral Reading Comprehension (% correct of 5 questions, 64-word text)	76.7 [±0.8]	-
Silent Reading Comprehension (% correct of 10 questions, 178-word text)	-	70.5 [±0.8]

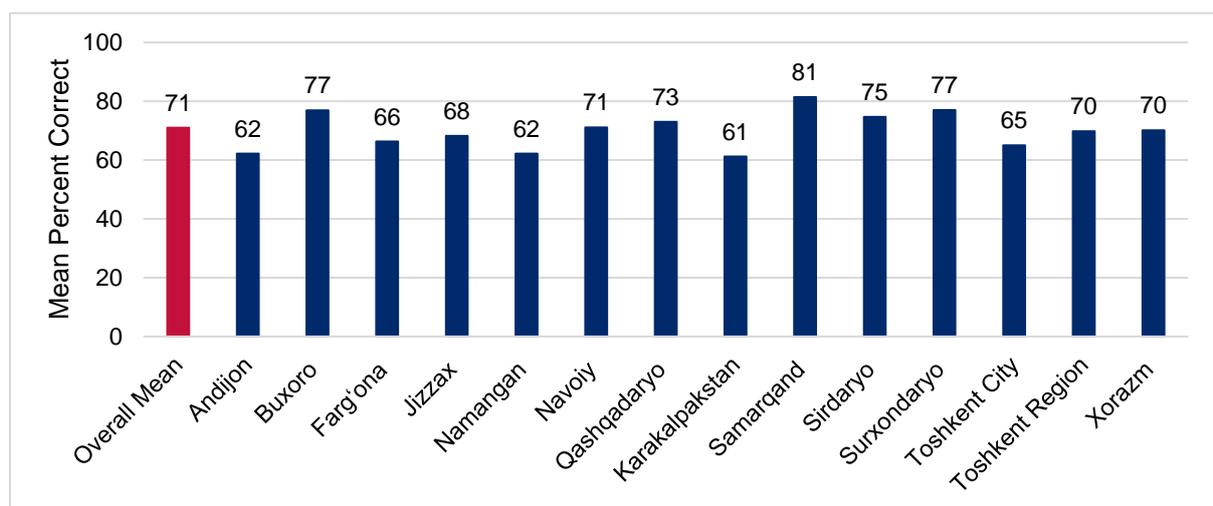
While reading performance was fairly strong in Uzbek-language schools across the board, there was some variation by region (**Figure 1**). For example, while the national mean for ORF was 49 cwpm in Grade 3 and 73 cwpm in Grade 5, the rate was highest in the Navoiy region in both grades, at 61 and 83 cwpm, respectively, and lowest in the Andijon region, at 41 and 62 cwpm.

Figure 1. Mean Oral Reading Fluency Rates in Uzbek in Uzbek-Language Schools, by Region



Similarly, while the national mean for silent reading comprehension in Grade 5 was 71%, students in the Samarqand region had the strongest performance, with 81% correct on average, compared to only 61% and 62% in Karakalpakstan and the Andijon region, respectively (Figure 2).

Figure 2. Grade 5 Mean Silent Reading Comprehension in Uzbek in Uzbek-Language Schools, Overall and by Region



3.2 Student Reading Performance in Non-Uzbek-Language Schools

3.2.1 Student reading performance in Karakalpak-language schools

Student Characteristics	Grade	
	Grade 3	Grade 5
Number of students assessed	588	588

The Karakalpak-language school sample was characterized by an exceptionally low rate of over-age enrollment and higher than average school-home language match and urbanicity. Their SES was average.

% Over-age	0.9	0.7
% Absent one or more days the previous week	34.9	20.3
% Speak Karakalpak at home	95.8	
% Urban	55.9	
% In lowest SES quartile	24.3	
% In highest SES quartile	24.2	

How well are students in Karakalpak-language schools learning to read in Karakalpak and in Uzbek at the beginning of Grade 3 and 5?

Students in Karakalpak-language schools showed a strong mastery of Karakalpak letter sounds at the beginning of Grade 3 as well as a firm foundation in decoding and word recognition (**Table 7**). Their mean ORF was at 42 cwpm in Grade 3 and rose to 78 cwpm by the beginning of Grade 5, representing an 87% increase in 2 years. Grade 3 comprehension was also fairly strong, with an average score of 70% correct and slightly over half the students scoring 80% or higher. Comprehension rates dipped slightly in Grade 5 to an average of 62% on the longer silent reading passage, and less than a third of students scored 80% or higher.

Table 7. Reading Performance in Karakalpak in Karakalpak-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n = 588)	Grade 5 (n = 588)
Letter Sound Identification (clspm)	81.6 [±2.3]	-
Nonword Reading (cnwpm)	35.5 [±1.2]	43.2 [±1.8]
ORF (cwpm)	41.6 [±2.0]	77.7 [±2.7]
Oral Reading Comprehension (% correct of 5 questions, 68-word text)	69.7 [±2.5]	-
Silent Reading Comprehension (% correct of 10 questions, 176-word text)	-	62.0 [±2.1]

Students in Karakalpak-language schools were also assessed in Uzbek as a second language (**Table 8**). Grade 3 students decoded on average 29 nonwords per minute in Uzbek, about 10 words fewer than their counterparts in Uzbek-language schools, and with lower accuracy (75% compared to 88%) on the same task. However, from Grade 3 to Grade 5, their ORF in Uzbek increased from 35 to 64 cwpm, an 82% increase. On average the Grade 3 students correctly answered approximately 3 out of 5 questions (63%) on the short passage in Uzbek that they read aloud, with just under half answering 4 or 5 correctly. In Grade 5 their average silent reading comprehension was at a similar level (58%), though the percentage of students scoring 80% or higher dropped to less than a third.

Table 8. Reading Performance in Uzbek as a Second Language in Karakalpak-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=588)	Grade 5 (n=588)
Nonword Reading (cnwpm)	29.1 [±1.7]	-
ORF (cwpm)	35.2 [±1.9]	64.0 [±2.4]
Oral Reading Comprehension (% correct of 5 questions, 70-word text)	62.5 [±3.3]	-
Silent Reading Comprehension (% correct of 10 questions, 133-word text)	-	58.1 [±3.2]

3.2.2 Student reading performance in Kazakh-language schools

The Kazakh-language school sample had slightly lower than average over-age enrollment and higher than average school-home language match. They were close to average in the remaining key demographics.

How well are students in Kazakh-language schools learning to read in Kazakh and in Uzbek at the beginning of Grade 3 and 5?

Student Characteristics	Grade	
	Grade 3	Grade 5
Number of students assessed	529	466
% Over-age	3.1	0.7
% Absent one or more days the previous week	32.7	25.5
% Speak Kazakh at home	93.2	
% Urban	32.2	
% In lowest SES quartile	23.6	
% In highest SES quartile	19.0	

At the beginning of Grade 3 students in Kazakh-language schools demonstrated strong mastery of Kazakh letter sounds and reasonable decoding and word recognition skills (**Table 9**). From Grade 3 to the beginning of Grade 5, their ORF increased from 46 to 80 cwpm, a 74% increase over Grade 3. Grade 3 students answered on average just over 3.5 out of 5 (73%) questions correctly on a short text that they read aloud in Kazakh, and 60% of students scored 80% or higher. In Grade 5, they performed similarly on the silent reading task (66%), though the percent of students scoring at or above 80% dropped to 43%.

Table 9. Reading Performance in Kazakh in Kazakh-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=529)	Grade 5 (n=466)
Letter Sound Identification (clspm)	79.3 [±2.2]	-
Nonword Reading (cnwpm)	38.6 [±2.2]	49.1 [±3.0]
ORF (cwpm)	45.8 [±2.7]	79.8 [±4.4]
Oral Reading Comprehension (% correct of 5 questions, 64-word text)	72.7 [±2.9]	-
Silent Reading Comprehension (% correct of 10 questions, 174-word text)	-	66.0 [±4.2]

Table 10 presents this group’s reading performance in their second language, Uzbek. Despite Uzbek being written in a different script (Latin) from their first language, Kazakh (Cyrillic), Grade 3 students in Kazakh-language schools were able to decode Uzbek nonwords at a rate only 7 cnwpm slower than their L1 Uzbek counterparts. However, 10% of these students scored zero on the Uzbek decoding task, the highest percentage of any group on any decoding task in any language. Their average ORF in Uzbek more than doubled from Grade 3 to Grade 5, increasing from 32 to 65 cwpm. Alongside this positive trajectory in fluency, their Uzbek comprehension also showed encouraging trends. In Grade 3, they averaged 66% comprehension on the short text that they read aloud in Uzbek, and they performed similarly on the silent reading comprehension in Grade 5 (70%). The percent of students scoring zero on comprehension decreased from 9% in Grade 3 to just 1% in Grade 5, and in both grades over half of the students (54%) scored at or above 80% comprehension.

Table 10. Reading Performance in Uzbek as a Second Language in Kazakh-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=529)	Grade 5 (n=466)
Nonword Reading (cnwpm)	31.7 [±2.7]	-
ORF (cwpm)	32.1 [±2.8]	64.6 [±4.9]
Oral Reading Comprehension (% correct of 5 questions, 70-word text)	67.0 [±3.8]	-
Silent Reading Comprehension (% correct of 10 questions, 133-word text)	-	70.2 [±4.0]

3.2.3 Student reading performance in Kyrgyz-language schools

The Kyrgyz-language school sample was characterized by low over-age enrollment but exceptionally high absenteeism, especially among the Grade 5 students. It was also highly rural. A strong majority of students were classified as belonging to the lowest SES quartile.

	Key Sample Characteristics	
	Grade 3	Grade 5
Number of students assessed	290	298
% Over-age	0.0	1.3
% Absent one or more days the previous week	34.5	52.8
% Speak Kyrgyz at home		92.2
% Urban		10.5
% In lowest SES quartile		71.1
% In highest SES quartile		3.3

How well are students in Kyrgyz-language schools learning to read in Kyrgyz and in Uzbek at the beginning of Grade 3 and 5?

Despite key demographic factors generally not favorable to learning outcomes (e.g., absenteeism, low SES), the Kyrgyz-language school students had a surprisingly strong performance in reading relative to the other language groups. At the beginning of Grade 3 students showed a solid foundation in Kyrgyz letter sound knowledge, decoding, and word recognition (**Table 11**). Typically, decoding unfamiliar, nonsense words take more time than reading real words in connected text, but these Grade 3 students read both item types at practically the same rate. Their mean ORF increased from 42 cwpm in Grade 3 to 72 at the beginning of Grade 5, a 71% gain. On average the Grade 3 students answered 67% of the comprehension questions correctly on the short passage that they read aloud in Kyrgyz, and the Grade 5 students were able to maintain if not slightly increase this level of comprehension on the longer silent reading passage, averaging 73% correct. This was the highest average in L1 silent reading comprehension among all the language groups.

Table 11. Reading Performance in Kyrgyz in Kyrgyz-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=290)	Grade 5 (n=298)
	Letter Sound Identification (clspm)	82.7 [±1.9]
Nonword Reading (cnwpm)	41.0 [±1.6]	47.8 [±1.8]
ORF (cwpm)	42.0 [±1.8]	72.4 [±2.8]
Oral Reading Comprehension (% correct of 5 questions, 66-word text)	67.0 [±3.0]	-
Silent Reading Comprehension (% correct of 10 questions, 180-word text)	-	72.7 [±2.8]

In reading Uzbek as a second language, the Grade 3 students in Kyrgyz-language schools had the lowest nonword decoding rate of all the L2 Uzbek-language groups (**Table 12**), possibly due in part to the challenge of learning a second script. (Kyrgyz is written in Cyrillic script, while Uzbek is written in Latin script.) Their ORF was also relatively low in Grade 3 (29 cwpm), but by Grade 5, Kyrgyz students had made tremendous gains in fluency and were reading Uzbek at basically the same rate as their L1 Uzbek counterparts (76 cwpm). Despite their somewhat rocky start in decoding, this language group had the highest level of comprehension in L2 Uzbek in both grades. The Grade 5 mean comprehension score was

an impressive 83%, up 14 percentage points from the Grade 3 average of 69%. This constituted the highest rate of comprehension of any group in any language. This was also the only group to show an increase in comprehension from Grade 3 to Grade 5 that was outside the confidence intervals. The percent of students scoring zero on comprehension also dropped from 11% in Grade 3 to 0% in Grade 5.

Table 12. Reading Performance in Uzbek as a Second Language in Kyrgyz-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=290)	Grade 5 (n=298)
Nonword Reading (cnwpm)	25.6 [±1.4]	-
ORF (cwpm)	29.2 [±1.8]	75.6 [±3.2]
Oral Reading Comprehension (% correct of 5 questions, 70-word text)	69.3 [±3.3]	-
Silent Reading Comprehension (% correct of 10 questions, 133-word text)	-	83.3 [±2.2]

More research is needed to better understand the drivers behind the Kyrgyz-language group's relatively strong reading performance, especially in Grade 5.

3.2.4 Student reading performance in Russian-language schools

The Russian-language school sample stood out from the others in its exceptionally high urbanicity and SES and exceptionally low school-home language match, with only 31% of students speaking Russian at home. The Grade 3 students also had the lowest absenteeism rate of the language groups.

Student Characteristics	Grade 3		Grade 5	
Number of students assessed	593		588	
% Over-age	2.5		2.1	
% Absent one or more days the previous week	19.5		29.0	
% Speak Russian at home		31.1		
% Urban		94.0		
% In lowest SES quartile		4.6		
% In highest SES quartile		66.3		

How well are students in Russian-language schools learning to read in Russian and in Uzbek at the beginning of Grade 3 and 5?

Compared to students in the other language groups, at the beginning of Grade 3, students in Russian-language schools showed relatively weaker mastery of the letter sounds in their language, naming on average only 60 clspm, which was 19 letters fewer than the next lowest rate (**Table 13**). They were also the least accurate in this task, identifying only 85% of the letter sounds correctly, compared to 95% or greater in the other language groups. Despite their underperformance in letter sound identification, their decoding and word recognition skills were solid in Grade 3 and increased substantially by the beginning of Grade 5; for example, in ORF, they went from reading 60 cwpm to 106, a 77% increase. On average, the Grade 3 students answered 64% of the questions correctly on the Russian passage that they read aloud, and half of the students scored 80% or higher. In Grade 5, the average comprehension level dipped slightly on the silent reading task to 58%, and only 31% scored at or above 80%.

Table 13. Reading Performance in Russian in Russian-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=593)	Grade 5 (n=588)
Letter Sound Identification (clspm)	60.0 [±4.7]	-
Nonword Reading (cnwpm)	40.2 [±2.0]	55.2 [±2.4]
ORF (cwpm)	60.2 [±4.4]	105.9 [±4.2]
Oral Reading Comprehension (% correct of 5 questions, 64-word text)	64.1 [±4.7]	-
Silent Reading Comprehension (% correct of 10 questions, 177-word text)	-	57.5 [±4.2]

As shown in **Table 14**, Grade 3 students in Russian-language schools showed strong decoding skills in L2 Uzbek as well, reading Uzbek nonwords at the fastest and most accurate rate of all the L2 Uzbek-language groups and even on par with L1 Uzbek students' performance, despite Uzbek and Russian being written in different scripts. Their Uzbek ORF also showed large gains, from 35 cwpm in Grade 3 to 80 cwpm in Grade 5, an increase of 129%. In fact, by Grade 5, Russian-language students were reading L2 Uzbek at a slightly faster rate (80 cwpm) than their L1 Uzbek counterparts (73 cwpm). Average comprehension in Uzbek held basically steady from Grade 3 (65%) to Grade 5 (64%), but the percentage of students scoring zero was cut in half, from 15% in Grade 3 to 7% in Grade 5. On the other hand, the percentage of students scoring 80% or higher also dropped, from 58% in Grade 3 to 48% in Grade 5.

Table 14. Reading Performance in Uzbek as a Second Language in Russian-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=593)	Grade 5 (n=588)
Nonword Reading (cnwpm)	37.0 [±2.5]	-
ORF (cwpm)	34.9 [±1.9]	80.1 [±5.9]
Oral Reading Comprehension (% correct of 5 questions, 70-word text)	65.4 [±5.1]	-
Silent Reading Comprehension (% correct of 10 questions, 133-word text)	-	63.8 [±4.7]

3.2.5 Student reading performance in Tajik-language schools

The Tajik-language school sample was characterized by a higher-than-average rate of over-age enrollment, as well as near universal school-home language match. This sample was also very rural and dominated by students in the lowest SES quartile.

	Student Characteristics	
	Grade 3	Grade 5
Number of students assessed	447	415
% Over-age	21.8	12.1
% Absent one or more days the previous week	46.0	39.9
% Speak Tajik at home		99.4
% Urban		9.6
% In lowest SES quartile		45.0
% In highest SES quartile		5.2

How well are students in Tajik-language schools learning to read in Tajik and in Uzbek at the beginning of Grade 3 and 5?

The data suggest that, on average, students in Tajik-language schools had an excellent foundation in letter sound knowledge, decoding, and word recognition, but struggled in comprehension compared to their counterparts in other language groups (**Table 15**). Grade 3 students had the lowest average performance in comprehension (59%) on the text that they read aloud in Tajik, with only 42% scoring 80% or higher, and 9% scoring zero. Their nonword decoding rate did not improve from Grade 3 to Grade 5, though they did show some modest gains in ORF, from 52 cwpm to 77. However, their average comprehension score dropped even further in Grade 5, down to a worrisome 42%, with only 10% of students scoring at or above 80%.

Table 15. Reading Performance in Tajik in Tajik-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=447)	Grade 5 (n=415)
	Letter Sound Identification (clsppm)	95.3 [±2.6]
Nonword Reading (cnwpm)	40.3 [±2.7]	41.4 [±2.4]
ORF (cwpm)	51.6 [±4.1]	77.2 [±4.5]
Oral Reading Comprehension (% correct of 5 questions, 70-word text)	59.4 [±4.7]	-
Silent Reading Comprehension (% correct of 10 questions, 200-word text)	-	41.6 [±4.2]

In reading Uzbek as a second language, the Grade 3 Tajik-language students had relatively weaker decoding and word recognition skills, possibly due in part to Tajik and Uzbek being written in different scripts (**Table 16**). They nearly doubled their Uzbek ORF from 28 cwpm in Grade 3 to 52 cwpm in Grade 5 but did not see a gain in comprehension. On average, the Grade 3 students were able to answer 68% of the questions correctly on the short passage that they read aloud in Uzbek, but this rate dropped to only 54% in Grade 5 on the silent reading task. In fact, in both grades they performed better in comprehension on the L2 Uzbek texts than on their own Tajik texts (though in Grade 5 the Uzbek text was substantially shorter than in Tajik).

Table 16. Reading Performance in Uzbek as a Second Language in Tajik-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=447)	Grade 5 (n=415)
Nonword Reading (cnwpm)	27.3 [±2.2]	-
ORF (cwpm)	27.8 [±2.6]	51.7 [±4.0]
Oral Reading Comprehension (% correct of 5 questions, 70-word text)	68.0 [±5.1]	-
Silent Reading Comprehension (% correct of 10 questions, 133-word text)	-	54.0 [±3.3]

3.2.6 Student reading performance in Turkmen-language schools

The Turkmen-language school sample was an outlier in its over-age enrollment, especially in Grade 3. The Grade 3 students also reported an exceptionally high rate of absenteeism. This sample was almost exclusively rural and was dominated by students in the lowest SES quartile.

Student Characteristics	Student Characteristics	
	Grade 3	Grade 5
Number of students assessed	191	208
% Over-age	73.3	34.6
% Absent one or more days the previous week	57.6	34.7
% Speak Turkmen at home		92.9
% Urban		2.5
% In lowest SES quartile		41.7
% In highest SES quartile		9.4

How well are students in Turkmen-language schools learning to read in Turkmen and in Uzbek at the beginning of Grade 3 and 5?

Students in Turkmen-language schools showed a strong mastery of letter sounds and an adequate foundation in decoding in Turkmen in Grade 3 (**Table 17**). However, their decoding and word recognition skills appeared to stagnate from Grade 3 to Grade 5; while their ORF increased from 36 cwpm to 49 cwpm, an increase of 36%, these are much lower gains compared to their counterparts in other language groups. Grade 3 students answered on average around 3 out of the 5 questions (63%) correctly on the text that they read aloud in Turkmen; Grade 5 students' average comprehension of the silent reading passage was at a similar though slightly lower level (56%). Close to half (46%) of the Grade 3 students scored 80% or higher in comprehension, but this portion dropped to only 22% in Grade 5.

Table 17. Reading Performance in Turkmen in Turkmen-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=191)	Grade 5 (n=208)
Letter Sound Identification (clspm)	81.8 [±4.0]	-
Nonword Reading (cnwpm)	33.7 [±2.8]	36.9 [±2.5]
ORF (cwpm)	35.8 [±4.5]	48.7 [±3.4]
Oral Reading Comprehension (% correct of 5 questions, 63-word text)	63.0 [±4.4]	-
Silent Reading Comprehension (% correct of 10 questions, 181-word text)	-	55.8 [±3.2]

In reading Uzbek as a second language, the Turkmen-language students had only slightly lower decoding rates than in Turkmen (**Table 18**). (Uzbek and Turkmen both use the same script.) Their ORF in Uzbek increased from 29 cwpm in Grade 3 to 54 cwpm in Grade 5, which constituted a much larger gain (90%) increase in their L2 ORF than in their L1 ORF (36%). Comprehension in Uzbek was at an average 61% in Grade 3 and dipped slightly to 52% in Grade 5. While the percentage of students scoring 80% or above fell from 48% in Grade 3 to only 22% in Grade 5, the percentage of students scoring 0% also decreased, from 10% to only 2%.

Table 18. Reading Performance in Uzbek as a Second Language in Turkmen-Language Schools, by Skill and Grade

Skill	Mean Scores [95% confidence interval]	
	Grade 3 (n=191)	Grade 5 (n=208)
Nonword Reading (cnwpm)	27.5 [±2.7]	-
ORF (cwpm)	28.6 [±4.0]	54.2 [±3.9]
Oral Reading Comprehension (% correct of 5 questions, 70-word text)	60.6 [±7.3]	-
Silent Reading Comprehension (% correct of 10 questions, 133-word text)	-	52.2 [±3.9]

3.3 How Does Performance in These Languages Compare to Results from Other Central Asian Countries for Which Data Are Available?

EGRA data collected 2021 in the Kyrgyz Republic⁸ and Tajikistan⁹ in four of the same language groups allow for some general comparison of current reading performance trends (Tables 19-22).

It is important to note that the students in each country were administered different instruments. That is, the words and passages that they read were different, even though they were administered in the same language and were “grade-level appropriate” for each country context. In addition, students in the Kyrgyz Republic and Tajikistan were assessed at the end of their Grade 2 and Grade 4 years, whereas students in Uzbekistan were assessed at the beginning of Grade 3 and Grade 5. Finally, the smaller the sample size, the less the statistical confidence.

Therefore, any cross-country comparisons are by nature very approximate. Nonetheless, with rare exception, the students in Uzbekistan appear to be performing on par with or ahead of their peers in these neighboring countries. The most evident exception is the relatively poor performance in silent reading comprehension (average 42% correct) of the Grade 5 Tajik-language school students in Uzbekistan compared to their counterparts in Tajikistan (average 79% correct, again with the caveat that the two groups were assessed using different passages).

Table 19. Comparison of Student Reading Performance in Uzbek-language Schools in Uzbekistan and the Kyrgyz Republic

Grade	Source	Nonwords (cnwpm)	ORF (cwpm)	Oral Reading Comprehension (% correct)	Silent Reading Comprehension (% correct)
End of Grade 2 / Beginning of Grade 3	Uzbekistan, 2021 (n=8034)	39.3	49.0	76.7	-
	Kyrgyz Republic, 2021 (n=253)	25.1	35.8	60.1	73.3
End of Grade 4 / Beginning of Grade 5	Uzbekistan, 2021 (n=8059)	49.0	72.7	-	70.5
	Kyrgyz Republic, 2021 (n=250)	35.2	59.9	71.6	73.4

⁸ Mamytova, A., Zholdosbekova, A., Ryan, J. & King, S. (2021). Okuu Keremet! Project – The Kyrgyz Republic: Report on the Baseline Assessment for the Early Grade Reading Program 2021.

⁹ School-to-School International & Chemonics International Inc. (2021). Early Grade Reading Assessment, Endline Report: USAID Read with Me Project. https://pdf.usaid.gov/pdf_docs/PA00Z5ST.pdf

Table 20. Comparison of Student Reading Performance in Kyrgyz-language Schools in Uzbekistan and the Kyrgyz Republic

Grade	Source	Nonwords (cnwpm)	ORF (cwpm)	Oral Reading Comprehension (% correct)	Silent Reading Comprehension (% correct)
End of Grade 2 / Beginning of Grade 3	Uzbekistan, 2021 (n=290)	41.0	42.0	67.0	-
	Kyrgyz Republic, 2021 (n=1335)	27.3	42.7	52.0	52.6
End of Grade 4 / Beginning of Grade 5	Uzbekistan, 2021 (n=298)	47.8	72.4	-	72.7
	Kyrgyz Republic, 2021 (n=1361)	34.9	66.7	62.5	81.2

Table 21. Comparison of Student Reading Performance in Russian-language Schools in Uzbekistan, the Kyrgyz Republic, and Tajikistan

Grade	Source	Nonwords (cnwpm)	ORF (cwpm)	Oral Reading Comprehension (% correct)	Silent Reading Comprehension (% correct)
End of Grade 2 / Beginning of Grade 3	Uzbekistan, 2021 (n=593)	40.2	60.2	64.1	-
	Kyrgyz Republic, 2021 (n=857)	29.2	42.7	43.2	61.1
	Tajikistan, 2021 (n=569)	27.0	43.3	59.8	46.4
End of Grade 4 / Beginning of Grade 5	Uzbekistan, 2021 (n=588)	55.2	105.9	-	57.5
	Kyrgyz Republic, 2021 (n=945)	40.5	84.7	62.0	62.1
	Tajikistan, 2021 (n=599)	35.0	74.6	60.5	46.9

Table 22. Comparison of Student Reading Performance in Tajik-language Schools in Uzbekistan and Tajikistan

Grade	Source	Nonwords (cnwpm)	ORF (cwpm)	Oral Reading Comprehension (% correct)	Silent Reading Comprehension (% correct)
End of Grade 2 / Beginning of Grade 3	Uzbekistan, 2021 (n=447)	40.3	51.6	59.4	-
	Tajikistan, 2021 (n=1342)	26.3	43.6	49.4	51.0
End of Grade 4 / Beginning of Grade 5	Uzbekistan, 2021 (n=415)	41.4	77.2	-	41.6
	Tajikistan, 2021 (n=1348)	31.5	76.0	48.7	79.3

3.4 How Well Are Children Learning to Do Math?

On average, the students at the beginning of Grade 3 are mastering the foundational skills needed to perform higher mathematics. They have a solid understanding of number and operations and can calculate with accuracy. Grade 3 students struggled somewhat with problems that required application of foundational skills, such as using addition or subtraction to solve a word problem.

Students at the beginning of Grade 5, on average, need more support in higher-order math problems, especially those that require critical thinking and application of basic concepts. These students were able to correctly answer slightly more than half of the 31 items on the math test (average score of 58%). Their performance in number and operations was the strongest of all domains, with most students answering most basic computation problems correctly and demonstrating an understanding of basic algebraic concepts. Grade 5 students struggled with word problems that were more complex and required critical thinking. Across other domains, the students again showed strength in basic and straightforward problems (such as identifying a shape or finding area of a routine shape) but struggled with application problems (such as calculating the perimeter of a non-routine shape or understanding the relationship between shapes).

Factors Associated with Higher Learning Outcomes in Math

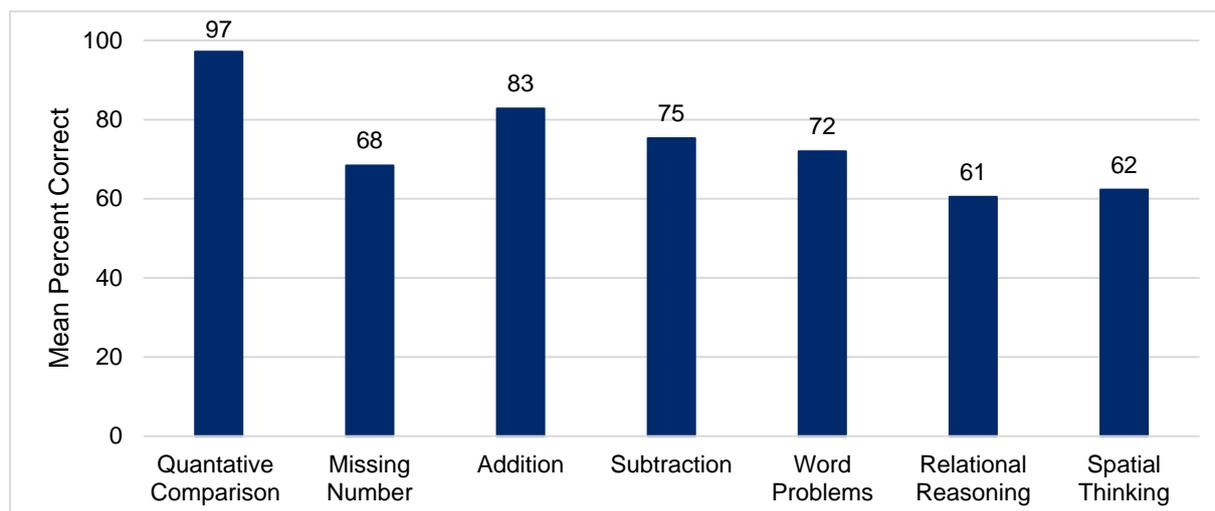
Regression models were used to investigate factors associated with higher learning outcomes in Grade 5 math, as measured by the percentage correct in the overall score. The results of the regression analysis showed that certain variables were statistically correlated with higher performance in math, including attendance and the language of instruction (**see Annex D**). For example, Grade 5 students who reported having missed more than one day of school the previous week scored on average 10.2 percentage points less than students who had not been absent. Similar to the results for reading, studying or doing homework every day when schools were closed showed a positive correlation with math performance when compared to students who studied once a week or less. Moreover, for the students who studied at home, doing so by watching lessons on TV correlated with slightly higher scores than doing homework by chat, doing homework given by the teacher or a family member, or studying on their own.

How well are students learning to do math by the beginning of Grade 3?

Overall, at the beginning of Grade 3 students showed high proficiency in core, foundational math skills. They struggled most with tasks that asked them to apply those foundational skills to more complex problems.

As shown in **Figure 113**, students showed near-perfect mastery of discriminating and comparing numbers (97%), including single and two- and three-digit numbers.

Figure 113. Overall Grade 3 Math Performance, by Skill



Comparatively, students scored lower on the missing number task (average score of 68%). **Table 23** provides the item analysis for this task, which shows that students did well with patterns that use simple counting and counting by fives, tens, hundreds when presented in a familiar way (i.e., ending in the number five or zero). However, students struggled with patterns that increased or decreased by 2 (Item 5 and Item 7, respectively) and counting by 5 when starting from a number other than 5 (Item 10).

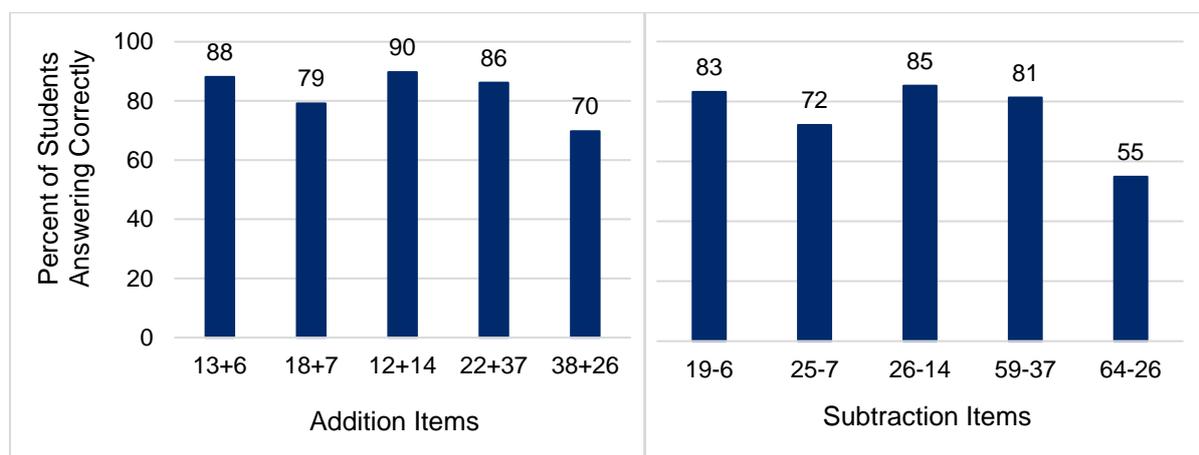
Table 23. Grade 3 Performance on Missing Number Task

Missing Number Task Item	Percentage of Students Answering Correctly	Percentage of Students Not Answering
5 6 7 <input type="text"/>	97.5	-
14 15 <input type="text"/> 17	96.7	-
20 <input type="text"/> 40 50	78.4	-
<input type="text"/> 300 400 500	90.3	-
2 4 6 <input type="text"/>	55.2	0.5
348 349 <input type="text"/> 351	81.5	0.9
28 <input type="text"/> 24 22	39.6	3.1
30 35 <input type="text"/> 45	71.7	3.8
550 540 530 <input type="text"/>	62.3	9.0
3 8 <input type="text"/> 18	13.8	10.0

On average, students scored 83% (about 4 out of 5 items) on addition and slightly lower (75%) on subtraction. This suggests that students can solve grade-level appropriate arithmetic problems using a strategy that works. However, as shown in **Figure**, students had difficulty with items that required them to regroup numbers (i.e., carrying and borrowing 10s), which is a more advanced technique for solving arithmetic problems. It also points to

the reliance that students have on using the traditional column method of solving operations problems.

Figure 12. Item Scores for Grade 3 Addition and Subtraction



The word problem task included six problems presented as stories, read aloud to the student, and required students to think critically and logically to make sense of the problem. Based on the students' performance on addition and subtraction tasks, it is no surprise that most students (85%–97%) were able to correctly answer problems requiring straightforward addition and subtraction. The percentage of students who correctly answered items that used more complex wording, had unknowns at the beginning of the problem, or required multiplication and division, was much lower (ranging from 57%–71%) (see **Table 24**). Nevertheless, these scores show that students generally were able to reason with word problems.

Table 24. Performance on Sample Simple and Complex Word Problems

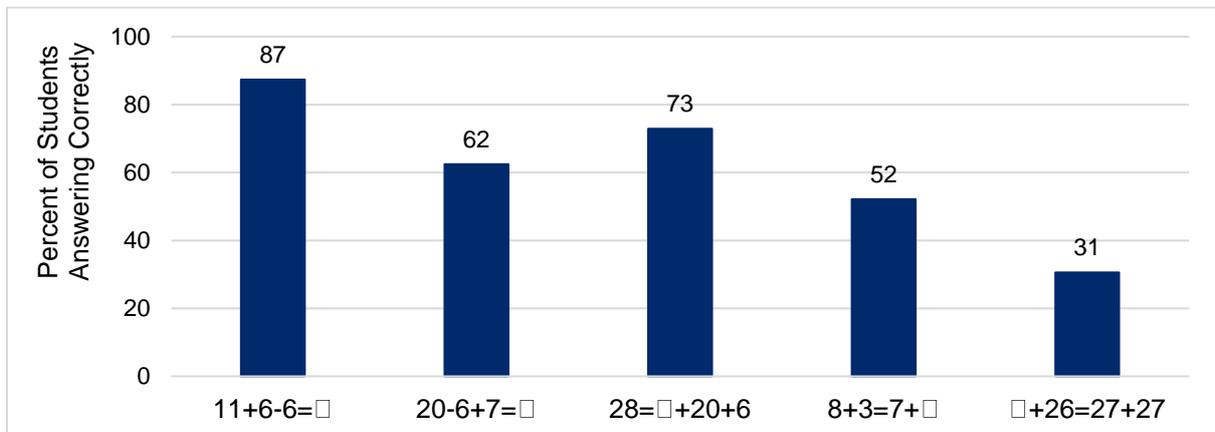
Complexity	Item	Percentage of students who answered correctly
Simple	"There are 2 children in the class. 3 more children come to the class. How many children are there in the classroom?"	97%
Complex	"There are 12 toffees; 4 children share the toffees equally. How many toffees does each child get?"	57%

As shown earlier in **Figure 11**, Grade 3 students struggled the most on the relational reasoning and spatial thinking subtasks (average score 61% and 62%, respectively). Both tasks presented problems that are solved mentally using deductive and logical thinking.

For the relational reasoning subtask, students were asked to solve five problems without pencil and paper (see **Figure**). Students tended to score higher on problems with addition and/or subtraction of 3 digits when all digits were on the same side of the equal sign, as seen in first problem (87% correct), second (67% correct), and third (73% correct). The first and second problems could be solved by calculating the answers instead of using relational reasoning as numbers were small and easy to mentally operate on. For example, in the first problem, students might have solved $11 + 6 = 17$. Then $17 - 6 = 11$. This strategy does not use relational reasoning. In contrast, a student that is using relational reasoning would see that adding 6 and subtracting 6 is 0, so the answer is 11.

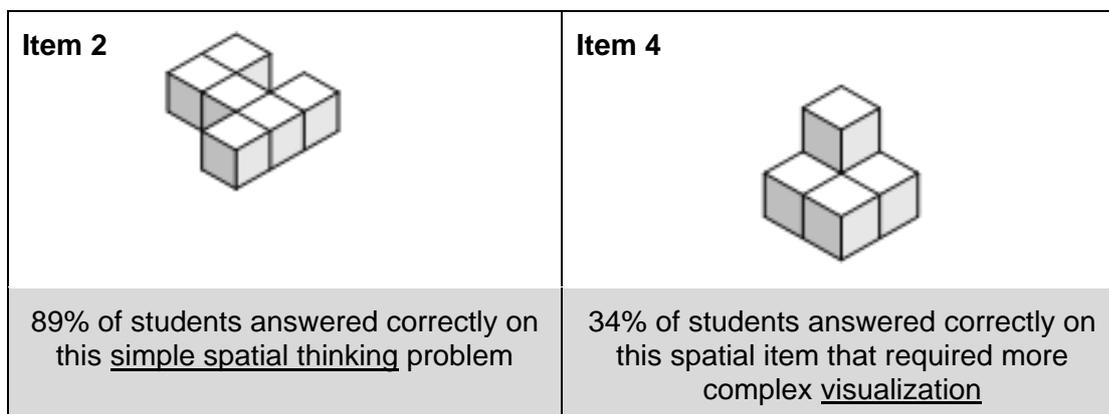
The fourth and fifth problems (shown in **Figure 13**) assessed an understanding of equivalence, where there was an operation on each side of the equal sign. Students struggled with these problems the most (52% and 31% correct, respectively); with the fifth problem, which had larger numbers and did not lend itself to solve mentally without using relational reasoning. For example, to solve the fifth problem with relational reasoning, the student might have seen that they need to make each side of the equation equal: 26 is one less than 27, so $26 + 28$ would be equal to $27 + 27$. Without relational reasoning, the problem becomes more complex: $27 + 27 = 54$, $54 - 26 = 28$.

Figure 13. Item Scores for Grade 3 Relational Reasoning



For the spatial reasoning subtasks, students were asked to say how many blocks were used in each image. Students performed well on items like Item 2 in **Figure 14**, where all blocks were shown in the image. Items like Item 4 contained hidden blocks that the students could not see, meaning they would need to visualize and mentally manipulate the figure to know how many blocks were used to create it.

Figure 14. Percent Correct Scores on Select Items from Special Thinking Subtask



Variation in Grade 3 Students' Performance

Language. As shown in **Figure 15** and **Figure 16**, for the most part Grade 3 student math performance did not vary significantly by the school language of instruction, with the exception of students in Turkmen-language schools, who consistently underperformed compared to their peers in the other language groups. Otherwise, no language group consistently outperformed any other.

Figure 15. Grade 3 Math Performance in Foundational Skills, by Language Group.

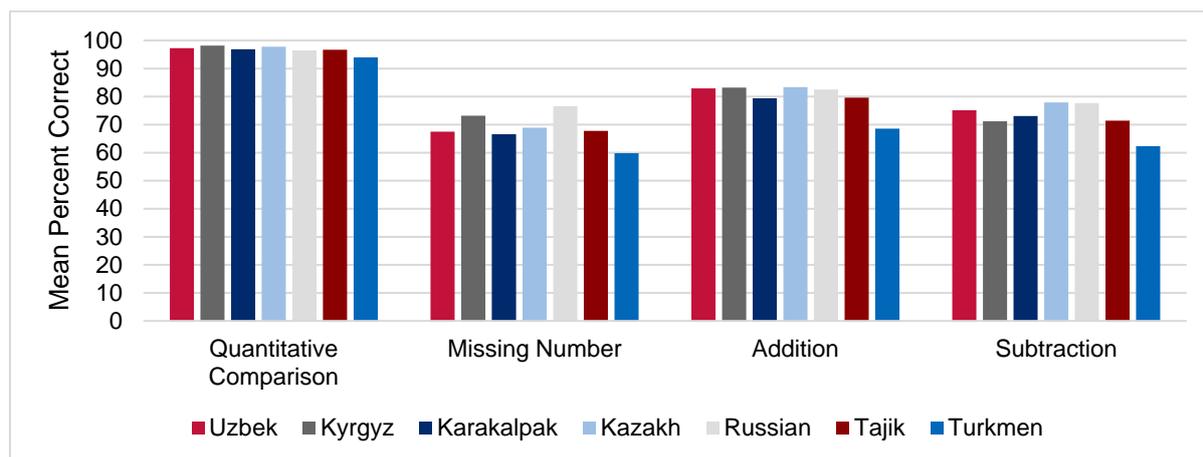
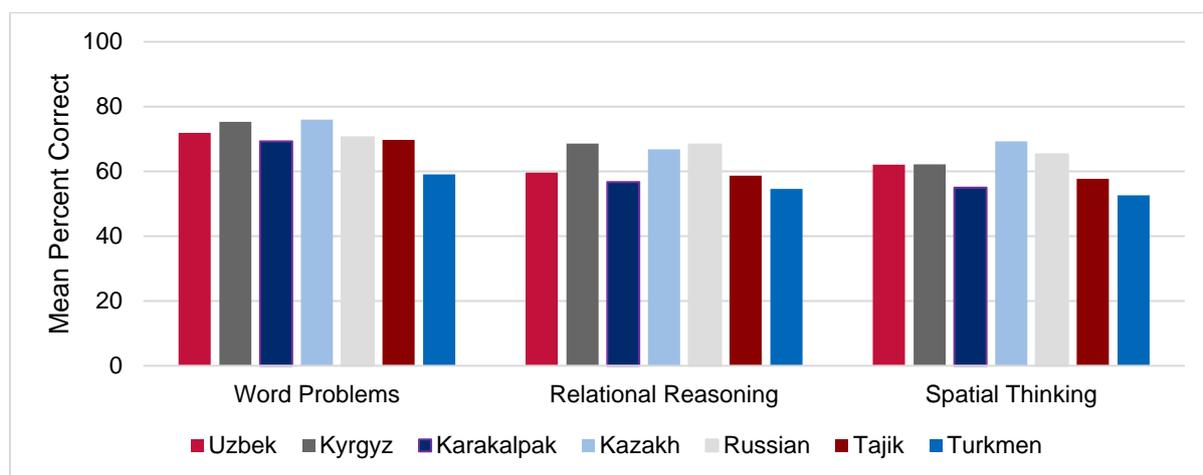


Figure 16. Grade 3 Math Performance in Application Skills, by Language Group.



Region. Student performance did vary somewhat by region (**Table 25**). On average, students in the Navoiy region outperformed their peers in the other regions in five of the seven tasks, while students in the Samarqand region underperformed also in five of the seven tasks. The largest difference was in the Relational Reasoning task, where the highest mean was 72% in the Navoiy region and the lowest was 50% in the Samarqand region, a difference of 22 percentage points. For most of the other tasks, the difference between high and low means was only 10–15 percentage points, and all regions performed well in the Quantitative Comparison tasks.

Table 25. Grade 3 Math Performance, by Region

Region	Mean Percent Correct						
	Quantitative Comparison	Missing Number	Addition	Subtraction	Word Problems	Relational Reasoning	Spatial Thinking
Overall	97	68	83	75	72	61	62
Andijon	97	63	80	70	68	54	55
Buxoro (Bukhara)	98	73	88	83	76	69	66
Farg'ona (Fergana)	98	70	83	72	75	55	60

Table 25. Grade 3 Math Performance, by Region

Region	Mean Percent Correct						
	Quantitative Comparison	Missing Number	Addition	Subtraction	Word Problems	Relational Reasoning	Spatial Thinking
Jizzax (Jizzakh)	97	67	84	79	73	60	66
Namangan	98	67	83	74	76	62	61
Navoiy	98	75	88	83	79	72	61
Qashqadaryo	98	68	85	79	72	68	67
Republic of Karakalpakstan	96	66	80	75	67	55	60
Samarqand	97	61	78	69	68	50	55
Sirdaryo	98	71	86	77	75	66	68
Surxondaryo	98	71	86	80	74	65	71
Tashkent independent city	98	70	84	78	72	61	65
Tashkent	97	69	83	74	72	61	65
Xorazm	97	65	79	74	65	54	56

Gender. By gender, there was no statistically significant difference in math performance in Grade 3 in the following tasks: quantitative comparison, addition, and subtraction. In the remaining tasks, boys outperformed girls by 1.7 percentage points in missing numbers, by 3.3 in word problems, by 3.4 in relational reasoning, and by 5.2 in spatial thinking. Each of these differences was statistically significant at $p < 0.001$.

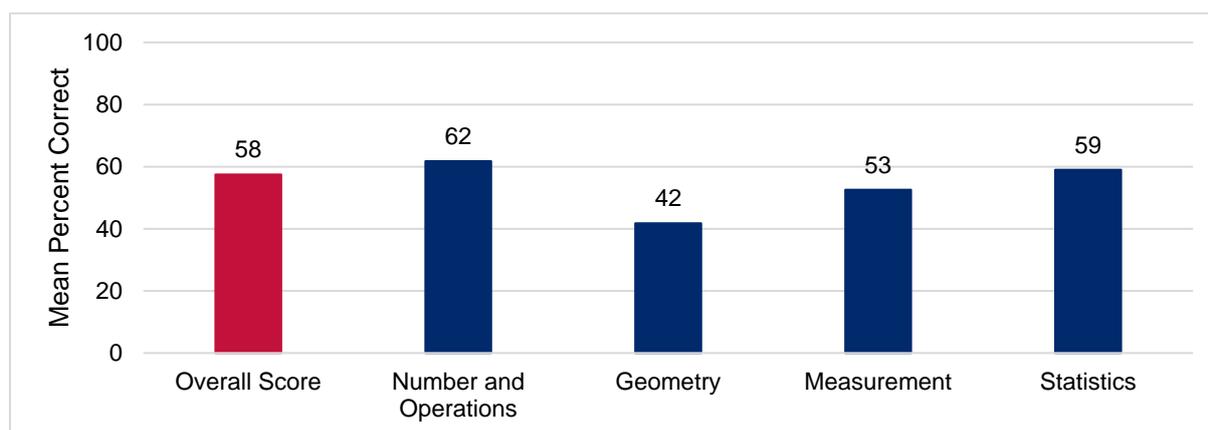
Urbanicity. In most tasks, the Grade 3 students in urban schools very slightly outperformed students in rural schools, but the difference was outside the margin of error and statistically significant only for the missing number task (71.4% [urban] vs 66.7% [rural], $p < 0.001$).

SES. Grade 3 students in the highest SES quartile outperformed their counterparts in the lowest SES quartile. The difference was negligible in the quantitative comparison task and greatest (by 6 percentage points) in the missing number task.

3.4.1 How well are students learning to do math by the beginning of Grade 5?

The average score on the Grade 5 math assessment was 58% correct (**Figure**). This contrasts to the scores on the Grade 3 assessment, where, on average students scored 70% or higher on almost all subtasks measuring foundational skills. The Grade 5 assessment contained more complex and diverse problems, asking students to apply their foundational skills to non-routine problems in addition to solving simple computation problems. The assessment also covered all domains that are common in Grade 5 global standards, including geometry, measurement, and statistics. The number and operations domain ranged from all four operations to fractions to algebraic concepts, providing a wide range of skills to be assessed.

Figure 17. Overall Grade 5 Math Performance, by Skill



Number and Operations

Number and operations was the strongest domain for students, with an average of 62% of items answered correctly. This domain also contained the largest number of items (18). However, performance was variable across items. For example, Item 1, 30×302 , was solved accurately by 76% of students. This was a straight computation task presented in a routine format that students were familiar with. Similarly, performance on Item 5, a simple word problem with a straightforward calculation¹⁰ also saw strong performance (66%).

In contrast, Item 2, a complex word problem¹¹ with a simpler calculation than Item 1, was solved correctly by only 35% of students, suggesting that students struggled in problems where they were asked to apply a skill to a real-world context. The word problem required students to think critically. Because 27 is not divisible by 12, students had to think about the problem context (if 12 students are in bus 1, then another 12 in bus 2, that is 24. There are 3 extra students, so we need one more bus). For this item, 25% of responses were “2,” where students most likely added $12 + 12 = 24$ to know that they needed 2 buses, and then did not add another bus for the additional 3 students. These students understood the problem but were not able to think critically about the extra 3 students and what to do with them. Then, 17% of responses were the number “15”, which students may have gotten from performing the calculation $27 - 12 = 15$. Other incorrect responses were 39 (6%) and 324 (2.3%), which can be found by either adding $27 + 12$ or multiplying 27×12 . These responses all point to students operating on the numbers in the word problem (27 and 12) without understanding the meaning of the word problem.

Within number and operations, students performed well on items with simple fractions with like denominators but struggled with more complex fractions problems. **Figure** below displays the three fraction items where students were asked to compare fractions. For sample Item 1, most students were able to say that $\frac{4}{6}$ is greater than $\frac{1}{6}$. This is a simple problem; since both denominators are “6”, a simple comparison between numerators ($4 > 1$) yields the correct answer. However, on Items 2 and 3, where the denominators were unlike, only 23% of students answered correctly that $\frac{1}{4}$ is greater than $\frac{1}{5}$. Students instead may have thought that since $5 > 4$, $\frac{1}{5}$ is therefore greater than $\frac{1}{4}$. These answers suggest that at the beginning of Grade 5, students do not have a strong grasp of the concept of a fraction, which is expected given a lack of coverage of this skill in Grade 4.

¹⁰ “5,064 pencils should be placed in boxes. There are a total of 6 boxes. We need to put the same number of pencils in each box. How many pencils can be placed in each box?”

¹¹ “27 students need to be taken on a trip. Each bus has 12 students in addition to the driver. How many buses will it take?”

Figure 18. Sample Fractions Items

Number	Item	Percentage of Students Who Answered Correctly
1	<p>Put a $<$, $>$, or $=$ in the circle to make the expression true.</p> $\frac{4}{6} \bigcirc \frac{1}{6}$	78%
2	<p>Put a $<$, $>$, or $=$ in the circle to make the expression true.</p> $\frac{1}{4} \bigcirc \frac{1}{5}$	23%
3	<p>Put a $<$, $>$, or $=$ in the circle to make the expression true.</p> $\frac{1}{7} \bigcirc \frac{1}{12}$	23%

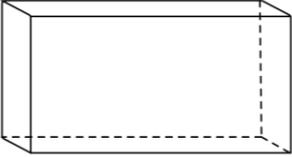
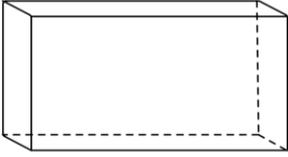
Students performed well on items that assessed algebraic concepts. On the two items where they were asked to fill in an unknown operator (such as $64 _ 12 = 52$), students performed very well, with 96% and 92% correct, respectively. Two items were given to assess understanding of brackets and the order of operations in equations. Students also performed reasonably well on these items, with 87% and 54% correct, respectively.

In addition to more complicated word problems, students also struggled with two problems asking them to read a number in words and write it as a number (i.e., Write as a number: Four million five hundred sixty-five), with only 35% of students answering this correctly. This suggests that students may need more support with place-value concepts with large numbers.

Geometry

Students struggled the most in the domain of geometry, with only 42% of items answered correctly. **Figure** below displays the percent correct for each item. Students performed well on Item 22, where they were asked to name a 3D image of a pyramid. Items 20 and 21 assessed students' knowledge of attributes of 3D figures (edges and faces) and students struggled with this. Item 23 assessed students' knowledge of the hierarchical relationships between shapes (specifically rectangles and squares). This was a higher order problem that required students to move beyond just identifying shapes but understanding how shapes are related to each other.

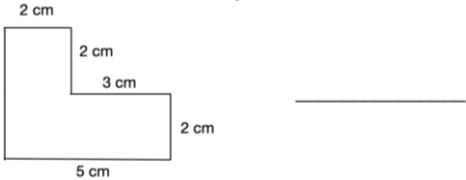
Figure 19. Sample Items Identifying Attributes of Shapes

Number	Item	Percentage of Students Who Answered Correctly
	Look at the rectangular prism. How many edges does it have?	
20	_____ 	14%
	Look at the rectangular prism. How many faces does it have?	
21	_____ 	38%

Measurement

Students answered 53% of items correctly in the measurement domain. These items assessed area, perimeter, estimation of units, and time. Students performed well on estimation of units and area of a standard figure (rectangle with sides given). However, when a nonstandard figure was given in Item 25 (see **Figure**), students struggled to apply the concept of perimeter to a new shape that was unfamiliar, suggesting that their knowledge of area and perimeter may be based on formulas and calculations instead of an understanding of the concept. For time, just about half of students (49%) were correctly able to read a clock and then answer a problem about elapsed time.

Figure 20. Routine and Non-Routine Items in Measurement

Item type	Item	Percentage of Students Who Answered Correctly
	Problem 24: Find the area	
Routine		57%
	Problem 25: Find the perimeter	
Non-routine		21%

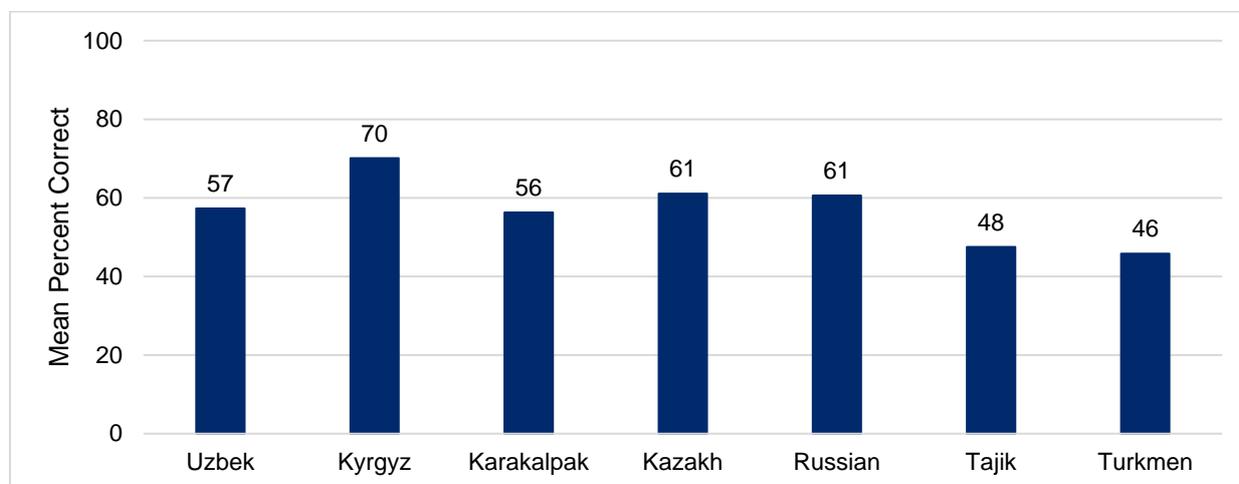
Statistics

Students answered 59% of items correctly in the statistics domain. For Items 28 and 29, they were shown a bar graph with information on which sports students in Grades 3 and 4 played. For Items 30 and 31, they were shown a bar graph on running times for two students. Items 28, 30, and 31 asked straightforward questions for which answers could be obtained directly from the bar graph. Item 31 was slightly more difficult, requiring students to identify a number in-between tick marks on a multiunit axis. Students performed relatively well on these items, especially given that statistics problems are not common in the current textbooks. Students struggled the most with Item 29 (45% correct), which was the most difficult problem of the four. It asked students to compare two bars on the graph and find the difference between them.

Variation in Student Performance

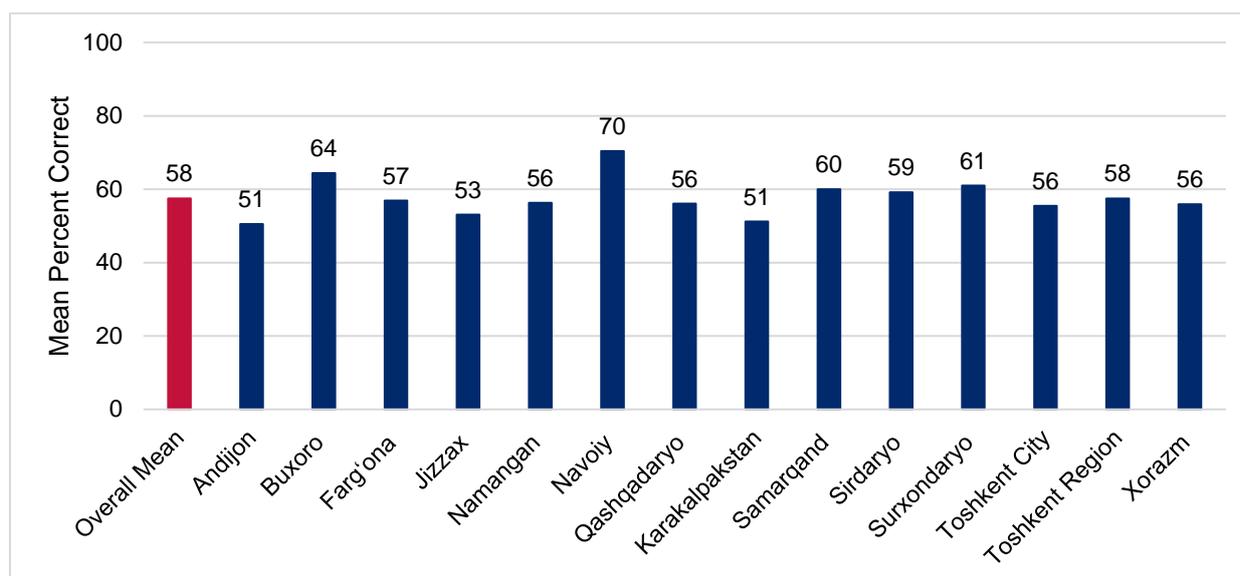
Language. Overall, students in the Kyrgyz-language group outscored those in other language groups, answering on average 70% of all items correct (**Figure**). The performance of students from four language groups—Uzbek, Karakalpal, Kazakh, and Russian—was very similar on average, but students from the Tajik and Turkmen-language groups both fell below average, with 48% and 46% correct, respectively.

Figure 21. Grade 5 Overall Math Score, by Language Group



Region. As it was for Grade 3, the Grade 5 math performance was strongest in Navoiy with an average 70% overall score. However, in contrast to Grade 3, where the students in the Samarqand region underperformed across the majority of the tasks, the Grade 5 students there had an average performance, while the performance was weakest in the Andijon region and in Karakalpakstan (51% each).

Figure 22. Grade 5 Overall Math Score, Overall and by Region



Gender. In Grade 5 boys slightly outperformed girls in the average overall score 58.7% to 56.3%, which was statistically significant at $p<0.001$. On the subskills, the difference was greatest in measurement (54.7% [boys] to 50.4% [girls], $p<0.001$). For geometry and statistics, the difference was less than 2 percentage points and was not statistically significant.

Urbanicity. The urbanicity of the school did not show a consistent or statistically significant relationship with math performance in Grade 5.

SES. In general, Grade 5 students in the highest SES quartile outperformed those in the lowest quartile by 5 percentage points in the overall score, and by similar margins in each subtask.

Conclusion and Recommendations

In summary, the results of the national survey revealed the following.

Reading

Students in Uzbekistan generally have solid foundational letter sound knowledge and decoding skills, both in their first language and even in Uzbek for those in non-Uzbek schools. Though second-language readers of Uzbek (understandably) show a delay behind the first-language Uzbek students in Grade 3, by the beginning of Grade 5 they made significant progress in closing the gap, even when Uzbek is written in a different script from their first language.

While students appear to be adequately mastering decoding and early comprehension skills, the data indicate a leveling off or decline in grade-level comprehension skills by Grade 5.

Nonetheless, the data appear to indicate that students in Uzbekistan are performing relatively well compared to their peers in neighboring countries.

Recommendations: Continue to support strong letter sound knowledge and decoding skills in the early grades. Ensure that students continue to deepen their comprehension skills as they progress through the grades so that they are increasingly equipped to handle more complex texts.

Math

The math scores for students at the beginning of Grade 3 and 5 point to proficiency in basic skills, and a need to emphasize conceptual understanding and application of these basic skills in novel ways.

Students at the beginning of Grade 3 have a solid foundation in core math skills such as comparing numbers, identifying patterns in numbers, and adding and subtracting numbers up to 100. These students showed more variation in performance on subtasks that required application of core skills and/or more conceptual knowledge (i.e., word problems, relational reasoning, and spatial reasoning). On these subtasks, students performed well on initial tasks, but struggled with later tasks that became increasingly complex.

Students at the beginning of Grade 5 answer, on average, slightly more than half of the questions correctly. They showed high proficiency on problems that required calculations across all operations as well as problems targeting algebraic thinking, suggesting that students were given multiple opportunities to develop and perfect these skills in their current curriculum. However, students struggled with tasks that required problem solving skills and application of basic skills, such as complex word problems and non-routine geometric figures.

Recommendations: Continue to support strong acquisition of proficiency of basic skills in the early grades. Strengthen the support in moving beyond basic skill practice to understanding how a basic skill can be applied to a new situation.

Underperforming Groups

The data reveal that some groups are underperforming compared to their peers. These data can inform initiatives to direct additional support to those who need it.

Language. Students in Tajik-language school consistently underperformed compared to their peers in other language groups, across the board in L1 reading and in L2 reading in Uzbek in Grade 5. That only 10% of Grade 5 Tajik students achieved the benchmark score of 80% or above in silent reading comprehension is very troubling. Some of this may be attributable to low attendance and low SES. In addition, students in Turkmen-language schools generally struggled the most with L2 reading in Uzbek.

In math, students in Turkmen-language schools showed the lowest performance on all skills in Grade 3 and most in Grade 5 as well, along with students in Tajik-language schools.

Recommendations: Conduct further research to determine the causes of the relatively poor performance. Direct targeted support to Tajik- and Turkmen-language schools in their respective areas of weakness.

Region. Students in Uzbek-language schools in the Andijon region and in Karakalpakstan consistently had the lowest regional performance in reading in both grades. The same was true for math in Grade 5, though in Grade 3, students in the Samarqand region also struggled compared to their counterparts in other regions.

Recommendations: Conduct further research to determine the causes of the relatively poor performance. Direct targeted support to schools in these regions.

Gender. Consistent with global trends, girls generally outperformed boys in reading in both grades, except in L2 Uzbek comprehension in Grade 5. While the differences in ORF were substantial (8–10 cwpm), the difference in comprehension was only 1-2 percentage points.

Meanwhile, in math, in Grade 3, girls and boys performed equally well in basic operations, but boys showed a small but statistically significant advantage in application skills. The gap in favor of boys continued in Grade 5 where boys outperformed girls in the overall score by 2 percentage points. In some subskills (number and operations, and measurement) the difference in scores was statistically significant, but not in others (geometry and statistics).

Recommendation: Both boys and girls are equally capable of succeeding at reading and at math. While the reasons behind their differences in performance are not fully understood, they may be due in large part to social norms and expectations. Steps can be taken to promote the love of and confidence in reading and math among students of all genders, while giving extra encouragement and support to those who underperform.

Urbanicity. Although students in urban schools on average showed a 4.3 cwpm advantage in ORF over students in rural schools, across reading and math tasks, the urbanicity of the school showed an inconsistent relationship with performance. Sometimes urban students outperformed rural students, but sometimes rural students outperformed urban students, and often the difference was not statistically significant. The encouraging takeaway is that learning success is not confined to urban schools.

Recommendation: Continue to allocate resources as equitably as possible to schools in both urban and rural areas.

SES. The survey had some surprising and counter-intuitive results regarding SES. In most country contexts, low SES is associated with poorer learning outcomes. On one hand, the regression analysis showed that not being in the bottom 10% SES was associated with an advantage of 3.9 cwpm in ORF, and a 2.9 percentage point increase in overall math score in Grade 5. On the other hand, while SES was associated with statistically significant differences in performance in ORF, there was no difference between the top and bottom quartile in performance in Grade 5 comprehension. In addition, some groups with relatively low SES, such as the Kyrgyz-language school students, performed exceptionally well compared to their peers with higher SES averages. Therefore, the SES variable did not behave consistently in the expected direction. It may be that the survey items used for SES did not adequately differentiate socioeconomic status.

Recommendation: Continue to allocate resources as equitably as possible to all schools, ensuring that students with lower SES have access to the same resources and opportunities as those with more means.

Factors Associated with Higher Performance

Over-age enrollment does not appear to be a significant problem in most places except in in Turkmen-language schools, and to a lesser extent, in Tajik-language schools. However, over-age also does not appear to be associated with a performance disadvantage for students as it does in some other country contexts.

Recommendation: Seek to better understand the drivers for over-age enrollment in schools with exceptionally high rates.

Absenteeism appears to be a significant problem, with on average 26% of students reporting having been absent one or more days in the previous week. This problem was especially high in Kyrgyz-, Tajik-, and Turkmen-language schools, as well as in the Andijon region. Since the COVID-19 pandemic was ongoing at the time of the assessment, it may have contributed to higher absenteeism. Not surprisingly, students who were absent more performed worse on average, both in reading and in math.

Recommendation: Conduct contextualized research to define the obstacles to attendance, especially in schools with high absenteeism rates. Undertake contextually targeted measures to improve and support student attendance.

Support during school closures. When schools were closed, studying and doing homework was associated with improved outcomes in reading but not in math.

Recommendation: Continue to explore better ways to support students during school closures.

School-home language match. Apart from students in Russian-language schools, most students are learning at school in the same language they speak at home, and this is an advantage for them in their performance.

Recommendation: Continue to support universal access to instruction in the home language.

Additional Areas for Further Research

In addition to the areas for further research highlighted above, other areas for potential exploration include the following.

- Why did the Kyrgyz students (especially Grade 5) perform so well despite factors otherwise associated with low performance (i.e., high absenteeism, low urbanicity, and low SES)?
- Why were there statistically significant differences in ORF performance by SES, but not at all in either comprehension task in either grade?
- How do the instruction and materials that students use (for example, their textbooks) differ across the language schools, and in what ways does this link to patterns found in this study (e.g., Kyrgyz-speaking students scoring significantly higher in Grade 5 math)?
- How are students thinking about application problems? What are the gaps in their understandings, in terms of conceptual knowledge?

In conclusion, the results of this survey contain a lot of good news, and the MOPE, school personnel, teachers, and students of Uzbekistan are to be commended for their collective efforts toward achieving high learning outcomes. Nonetheless, the data reveal some areas to target for strengthening as the nation continues to strive to build a quality and equitable education system for all students.

Annex A: Sample Methodology

This annex provides information about the population of interest and the sample methodology used for this study. It also provides information about the sampling weights and the precision estimates obtained based on the sample size, the sample strategy, and the student performance.

Population and List Frame

The population of interest included all grade 3 and grade 5 students attending non-special needs public schools that had an enrollment of at least 10 grade 2 students and 10 grade 4 students¹². The population list frame of schools was provided by the Ministry of Public Education of the Republic of Uzbekistan. After making the appropriate exclusions, a total of 9,635 schools were in the population list. The counts of the excluded schools and reasons for exclusion can be found in **Table A-1**.

Table A-1. Counts of Excluded Schools* and Reason for the Exclusion

Reason for Exclusion	Number of Schools	Percent of Schools
Not excluded	9,635	85
Pilot School	105	1
Both G2 and G4 Enrollment = 0	423	4
G2 Enrollment = 0	375	3
G4 Enrollment = 0	416	4
Both G2 and G4 Enrollment < 10	132	1
G2 Enrollment < 10	137	1
G4 Enrollment < 10	112	1
Special School (Blind, Deaf, etc.)	24	0
Special school - Bevosita XTV tasarrufidagi muassasalar	5	0

*Schools were separated out by school and language of instruction. So, if one physical school instructed in Uzbek and Russian, that was counted two times, once for Uzbek, once for Russian

Sample Methodology

The proposed sample was derived to answer the key research questions of the study. Specifically, the sample was derived to provide national representation of the non-Uzbek language schools, and regional representation of the Uzbek language schools. The sample required approximately 50 schools to be selected for each non-Uzbek language, except for languages that had very small number of schools in the population such as Kyrgyz: N=28; Tajik: N=78; and Turkmen: N=20. For Uzbek language schools, 50 schools were required to be sampled within each region.

The sample methodology consisted of 2-stage samples of schools and students. Schools were stratified by language, and schools instructing in the Uzbek language were further stratified by region, for a total of 20 different strata. Schools were selected proportional to the combined grade 2 and grade 4 enrollment. For each sampled school, two schools that most

¹² Originally the study was meant to assess end of year grade 2 and grade 4 students in May of 2021. COVID prevented the data collection to occur at that time, so grade 3 and grade 5 student assessed in November of 2021 served as proxies for end of the year grade 2 and grade 4 students.

resembled the selected school in the same stratum and the same district were selected to be the originally sampled school's replacement¹³. Once the assessors arrived at the school, they stratified the grade 3 and grade 5 students by grade and gender. They then randomly sampled six grade 3 girls, six grade 3 boys, six grade 5 girls, and six grade 5 boys, for a total of 12 students per grade, 24 students per school. The sample was drawn from only students who were present the day of the data collection. **Table A-2** provides a summary of the sample methodology used.

Table A-2. Sample Methodology Summary

Stage Number	Item Sampled	Stratified by (Number of strata)	Probability of Selection
Stage 1	Schools	Region - Language (20)	Proportion proportional to enrollment
Stage 2	Standard 3 and Standard 5 students	Grade and Gender (4)	Equal

Final Sample Counts and Weighted Estimate Counts

A total of 10,672 Grade 3 students and 10,622 Grade 5 students were assessed across 935 schools. Data collection started on November 15, 2021 and ended on December 14, 2021. The sampled counts and estimated population counts are presented in **Table A-3**. Sample weights were calculated for all sampled schools and students as the inverse of their probability of being selected within the given stratum. All school weights were scaled to their population within each stratum. All student weights were scaled to the enrollment population within each stratum and grade. Unless explicitly stated, all reported estimates were calculated using the appropriate sample weights because the sample weights adjust for any under/over representation in the sample, making the estimates representative of the specified population.

Table A-3. Final Sample Counts and Weighted Counts of Schools and Students

Strata: Region – Language of Assessment	Sample Counts of Schools	Weighted Counts of Schools	Sample Counts of Grade 5 Students	Weighted Counts Grade 3 Students	Sample Counts of Grade 5 Students	Weighted Counts Grade 5 Students
Toshkent City – Uzbek	49	253	573	21817	576	25627
Andijon– Uzbek	50	687	588	47487	591	57124
Buxoro (Bukhara) – Uzbek	50	489	590	28673	562	30771
Farg'ona (Fergana) – Uzbek	50	813	573	55708	574	57558
Jizzax (Jizzakh) – Uzbek	50	476	594	22224	586	24783
Namangan– Uzbek	53	648	603	44658	621	48113
Navoiy– Uzbek	50	256	564	14605	562	15353
Qashqadaryo– Uzbek	50	1043	547	57418	585	59564
Samarqand– Uzbek	50	1160	553	65763	560	69426

¹³ A school would serve as a replacement school only if it was not originally sampled. In some cases, there were one or zero replacement schools available in the same stratum or district.

Table A-3. Final Sample Counts and Weighted Counts of Schools and Students

Strata: Region – Language of Assessment	Sample Counts of Schools	Weighted Counts of Schools	Sample Counts of Grade 5 Students	Weighted Counts Grade 3 Students	Sample Counts of Grade 5 Students	Weighted Counts Grade 5 Students
Sirdaryo– Uzbek	50	283	581	14169	565	15990
Surxondaryo– Uzbek	50	814	540	47590	566	46471
Toshkent – Uzbek	50	750	582	39972	595	44364
Xorazm– Uzbek	49	491	565	31591	544	32800
Republic of Karakalpakstan- Uzbek	50	298	581	13487	572	14851
Kyrgyz - National	27	28	290	492	298	520
Karakalpak - National	50	291	588	10542	588	11652
Kazakh - National	50	160	529	3242	466	3453
Russian - National	50	597	593	59825	588	51538
Tajik - National	40	78	447	2693	415	2355
Turkmen - National	18	20	191	625	208	622
Totals	936	9635	10672	582581	10622	612935

Representation and Precision

As mentioned previously, about 50 schools needed to be sampled for each non-Uzbek language.¹⁴ For Uzbek language schools, 50 schools needed to be sampled within each region. The sample was designed to be able to report the estimated mean oral reading fluency (ORF) within each stratum with a 95% confidence interval band of about ± 3.5 words per minute (or smaller) for grade 3 students, and within ± 4.5 words per minute (or smaller) for grade 5 students. **Table A-4** provides the final counts, means, standard deviation, intraclass correlation and 95% confidence intervals. The ORF precision for nearly all strata met the ± 3.5 words per minute 95% confident band for grade 3 students, (the data obtained the desired precisions for estimating the average reading fluency in these strata) except for: Russian, Tajik, and Turkmen. Even so, these precision estimates were still ± 4.5 words per minute or better. The Russian had a higher than predicted standard error (27.2 vs predicted 24) while Tajik and Turkmen had a higher intraclass correlation than predicted (0.404 and 0.331 vs. predicted 0.20).

Table A-4. Grade 3 Oral Reading Fluency, in words per minute, means and precision estimates

Region and Language	Count	Mean	Standard Deviation	Intra Class Correlation	95% Confidence Band	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Toshkent City – Uzbek	573	55.5	23.9	0.147	± 3.1	52.4	58.7
Andijon– Uzbek	588	41.3	21.4	0.138	± 2.4	38.9	43.7
Buxoro(Bukhara) – Uzbek	590	53.5	23	0.136	± 2.9	50.6	56.4
Farg'ona (Fergana) – Uzbek	573	47.9	22.6	0.174	± 3.1	44.8	50.9
Jizzax (Jizzakh) – Uzbek	594	49.5	21.8	0.152	± 2.8	46.7	52.3

¹⁴ 50 schools were to be selected for each non-Uzbek language, except for languages that had very small number of schools in the population such as Kyrgyz: N=28; Tajik: N=78; and Turkmen: N=20

Table A-4. Grade 3 Oral Reading Fluency, in words per minute, means and precision estimates

Region and Language	Count	Mean	Standard Deviation	Intra Class Correlation	95% Confidence Band	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Namangan– Uzbek	603	47.3	22	0.117	±2.6	44.7	49.9
Navoiy– Uzbek	564	61.4	24.4	0.219	±3.4	57.9	64.8
Qashqadaryo– Uzbek	547	52.5	24.7	0.121	±3.1	49.4	55.6
Samarqand– Uzbek	553	49.2	24.7	0.271	±4	45.2	53.2
Sirdaryo– Uzbek	581	50.2	24.4	0.111	±2.8	47.4	53.1
Surxondaryo– Uzbek	540	48.7	21.7	0.199	±3.1	45.6	51.7
Toshkent – Uzbek	582	49	23	0.189	±3.2	45.8	52.2
Xorazm– Uzbek	565	45.9	22.5	0.172	±3	42.9	49
Republic of Karakalpakstan Uzbek	581	43.6	23	0.208	±3.2	40.5	46.8
Kyrgyz - National	290	42	20.2	0.106	±1.8	40.2	43.8
Karakalpak - National	588	41.6	21.6	0.128	±1.9	39.7	43.5
Kazakh - National	529	45.8	22.5	0.131	±2.8	43.1	48.6
Russian - National	593	60.2	27.2	0.277	±4.4	55.9	64.6
Tajik - National	447	51.6	25.5	0.404	±4.1	47.5	55.7
Turkmen - National	191	35.8	21.9	0.331	±4.5	31.4	40.3
Overall	10672	50	24.1	0.224	±0.9	49.1	50.9

Table A-5 provides the final counts, means, standard deviation, intraclass correlation and the final 95% confidence intervals. The ORF precision for nearly all strata met the ±4.5 words per minute for grade 5 students, except for: Samarqand– Uzbek (±4.7) and Tajik (±4.6). Both of which barely missed the ±4.5 words per minute. These were due to slightly higher standard deviations (28.6 and 27.2 vs. predicted 26) and slightly higher intraclass correlation (0.273 and 0.278 vs. predicted 0.25). In general, the sample size and sample methodology provided the appropriate representation of the overall population of interest and its desegregated subgroups. It also provided the appropriate precisions or confidence in those estimates.

Table A-5. Grade 5 Oral Reading Fluency, in words per minute, means and precision estimates

Region and Language	Count	Mean	Standard Deviation	Intra Class Correlation	95% Confidence Band	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Toshkent City – Uzbek	576	75.8	28.8	0.127	±3.1	72.7	78.9
Andijon – Uzbek	591	61.9	23.6	0.127	±2.5	59.4	64.4
Buxoro (Bukhara) – Uzbek	561	79.3	25.3	0.123	±3.1	76.2	82.5
Farg'ona (Fergana) – Uzbek	574	68.8	25.3	0.126	±3.1	65.7	72
Jizzax (Jizzakh) – Uzbek	586	71	24.9	0.102	±2.8	68.1	73.8
Namangan– Uzbek	621	68.1	25.2	0.175	±3.3	64.8	71.4
Navoiy– Uzbek	562	83.4	26.8	0.21	±3.6	79.7	87
Qashqadaryo– Uzbek	585	80.3	27.6	0.204	±4	76.4	84.3

Table A-5. Grade 5 Oral Reading Fluency, in words per minute, means and precision estimates

Region and Language	Count	Mean	Standard Deviation	Intra Class Correlation	95% Confidence Band	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Samarqand– Uzbek	560	77.2	28.6	0.273	±4.7	72.5	81.9
Sirdaryo– Uzbek	565	71.6	26.4	0.057	±2.6	69	74.3
Surxondaryo– Uzbek	566	74.9	27.1	0.206	±4.1	70.8	78.9
Toshkent – Uzbek	595	72.4	28.3	0.167	±3.7	68.7	76.1
Xorazm– Uzbek	544	69.9	24.9	0.072	±2.8	67.2	72.7
Republic of Karakalpakstan- Uzbek	571	65.8	26.2	0.154	±3.4	62.4	69.3
Kyrgyz - National	298	72.4	26.4	0.141	±2.8	69.6	75.2
Karakalpak - National	588	77.7	28.3	0.165	±2.8	75	80.5
Kazakh - National	466	79.8	28.7	0.281	±4.4	75.4	84.1
Russian - National	588	105.9	30.1	0.217	±4.2	101.7	110.1
Tajik - National	415	77.2	27.2	0.278	±4.6	72.7	81.8
Turkmen - National	208	48.7	22.6	0.175	±3.3	45.3	52
Overall	10620	75.6	28.9	0.259	±1.0	74.6	76.6

Annex B: Socioeconomic Status Index

This annex provides information about the socioeconomic wealth (SES) index for the students sampled in this study.

Deriving SES

The SES index is a relative score for each student in the sample that depended on what students reported having at home. We used the principal component analysis (PCA) from 16 household items to derive this index. The PCA model was run for the combined grade 3 and grade 5 students. **Table B-1** provides the variables used, in order of the scoring weight associated with the item. For example, cooking with a gas stove indicated a higher degree of SES (0.594) while cooking with firewood indicated a lower degree of SES (-0.481).

Table B-1. Household items used to derive the socioeconomic status

	Factor Variables	Variable Labels	% Missing	% Yes	Factor Coefficients
1	cookingfuel_4	A gas stove: How is food most often cooked at your home?	.4%	91.5	0.594032
2	water_4	Water pipe/ tap in your home: Where do you normally get your water from at home?	.3%	48.9	0.341275
3	fridge	Does your family have a refrigerator	.2%	78.6	0.203501
4	computer	Does your family have a computer	.2%	30.1	0.170295
5	car	Does your family have a car/truck	.1%	53.3	0.138432
6	phone	Does your family have a mobile phone	.2%	93.3	0.087418
7	bike	Does your family have a bicycle	.2%	81.9	0.050339
8	radio	Does your family have a radio	.2%	26.3	0.026851
9	water_5	Water truck or tank: Where do you normally get your water from at home?	.3%	8.1	-0.02379
10	motorcycle	Does your family have a motorcycle	.2%	7.2	-0.03335
11	water_2	Well or borehole: Where do you normally get your water from at home?	.3%	10	-0.10814
12	water_1	River stream or lake: Where do you normally get your water from at home?	.3%	3.5	-0.18407
13	water_3	Communal tap: Where do you normally get your water from at home?	.3%	27.8	-0.20881
14	cookingfuel_6	Other: How is food most often cooked at your home?	.4%	1.5	-0.22993
15	cookingfuel_5	An electric stove/cooker: How is food most often cooked at your home?	.4%	1.8	-0.23388
16	cookingfuel_1	Firewood: How is food most often cooked at your home?	.4%	4.8	-0.48142

The final equation of for each student was based on the factor coefficient and whether the student reported having the item at home.

$$\begin{aligned} \text{SES Index Score} = & .026851*\text{radio} + .0874177*\text{phone} + .1702945*\text{computer} + \\ & .203501031*\text{fridge} + .050339*\text{bike} + -.0333490*\text{motorcycle} + .1384321*\text{car} + - \\ & .1840667*\text{water_1} + -.1081351*\text{water_2} + -.2088067584348163*\text{water_3} + \\ & .3412748*\text{water_4} + -.0237859*\text{water_5} + -.481421*\text{cookingfuel_1} + .59403*\text{cookingfuel_4} \\ & + -.233876*\text{cookingfuel_5} + -.229931*\text{cookingfuel_6} \end{aligned}$$

Analyzing SES

The SES index came out to an average value of 1.02 for all students in the sample. The G3 and G5 students reported similar items in the house, which would be expected, and had a very similar distribution as seen in **Figure B-1**. The overall means by grade was 1.01 for grade 3 and 1.03 for grade 5. It should be noted that about 50% of the variation in the SES index score came in the bottom 10 percentiles.

Figure B-1. Distribution of SES Index Score by Grade

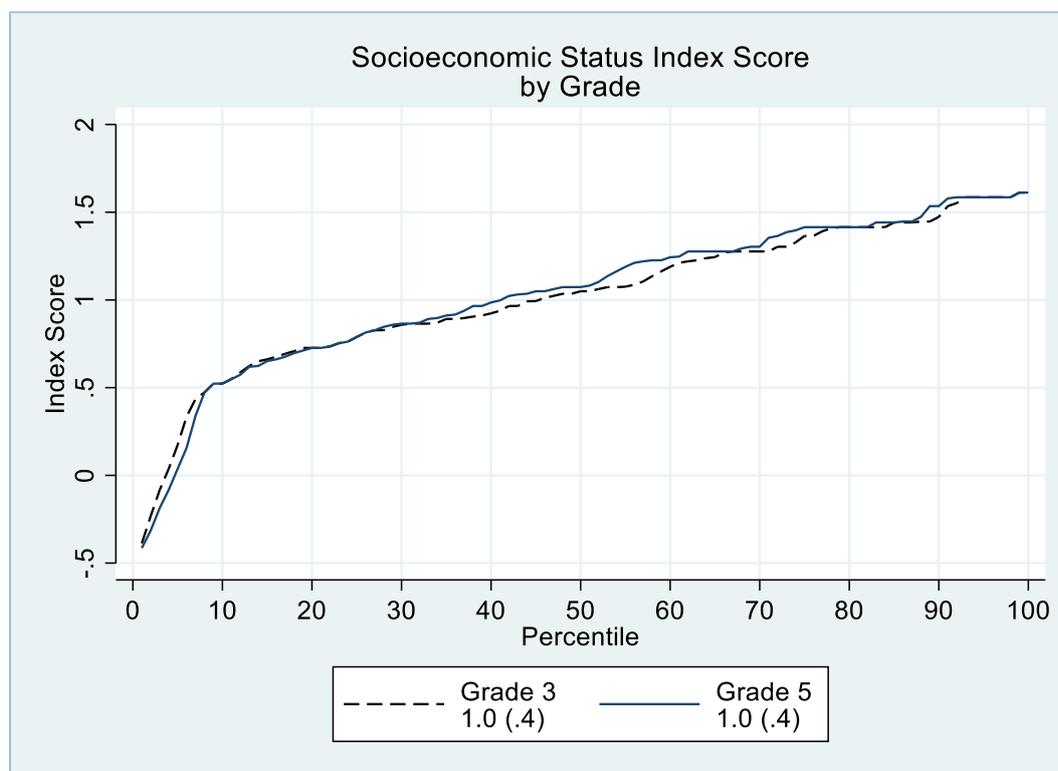


Table B-2 provides the SES score index's range, mean, and standard deviation by region. Tashkent City had the highest SES average at 1.33 while the Republic of Karakalpakstan had the lowest SES average with 0.87.

Table B-2. Socioeconomic Range, Mean, and Standard Deviation of the Grade 3 and Grade 5 Students by Region

Region	Sample Count	Range	Mean	Standard Deviation
Tashkent City	1636	[0,2]	1.33	0.27
Xorazm	1154	[0,2]	1.13	0.3
Navoiy	1395	[-1,2]	1.12	0.37
Buxoro	1169	[-1,2]	1.04	0.44
Republic of Karakalpakstan	3221	[-1,2]	1.03	0.41
Tashkent Region	1836	[-1,2]	1.02	0.41
Sirdaryo	1143	[-1,2]	1	0.44
Farg'ona	1228	[-1,2]	0.99	0.46
Samarqand	1358	[-1,2]	0.97	0.48

Table B-2. Socioeconomic Range, Mean, and Standard Deviation of the Grade 3 and Grade 5 Students by Region

Region	Sample Count	Range	Mean	Standard Deviation
Namangan	1264	[-1,2]	0.96	0.46
Andijon	1486	[-1,2]	0.91	0.52
Jizzax	1400	[-1,2]	0.91	0.56
Surxondaryo	1315	[-1,2]	0.9	0.43
Qashqadaryo	1448	[-1,2]	0.87	0.37
Overall	21053	[-1,2]	1.02	0.44

Annex C: Reading Score Distributions by Language and Grade

Annex C presents the distributions of the oral reading fluency scores and reading comprehension scores in the respective languages of instruction and in Uzbek as a second language (for students in non-Uzbek language schools), by language group and grade.

Figure C-1. Distribution of Uzbek L1 Oral Reading Fluency Scores for Students in Uzbek-Language schools, by Grade

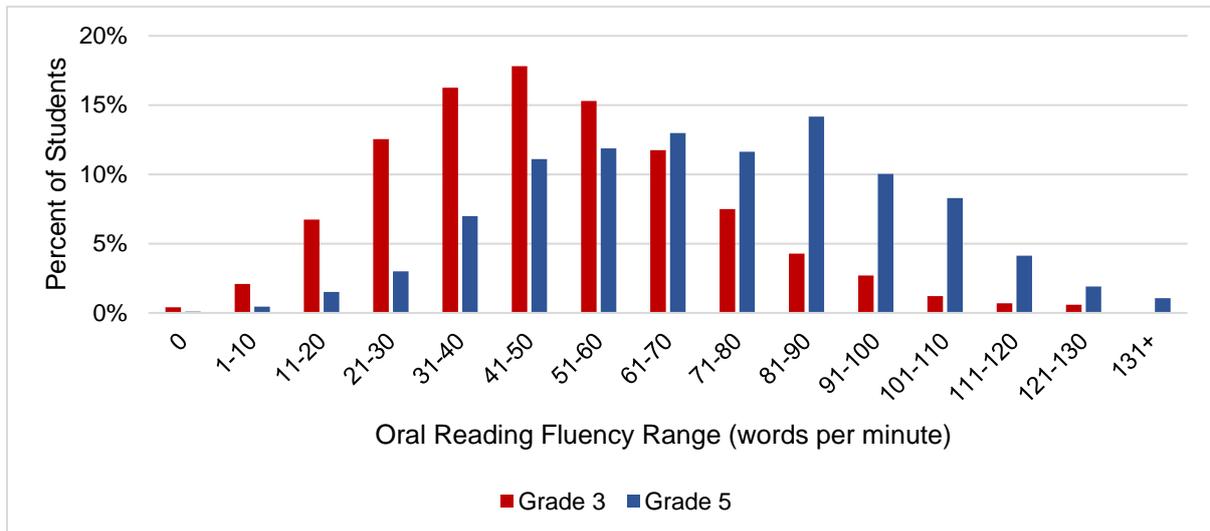


Figure C-2. Distribution of Uzbek L1 Reading Comprehension Scores for Students in Uzbek-Language schools, by Grade

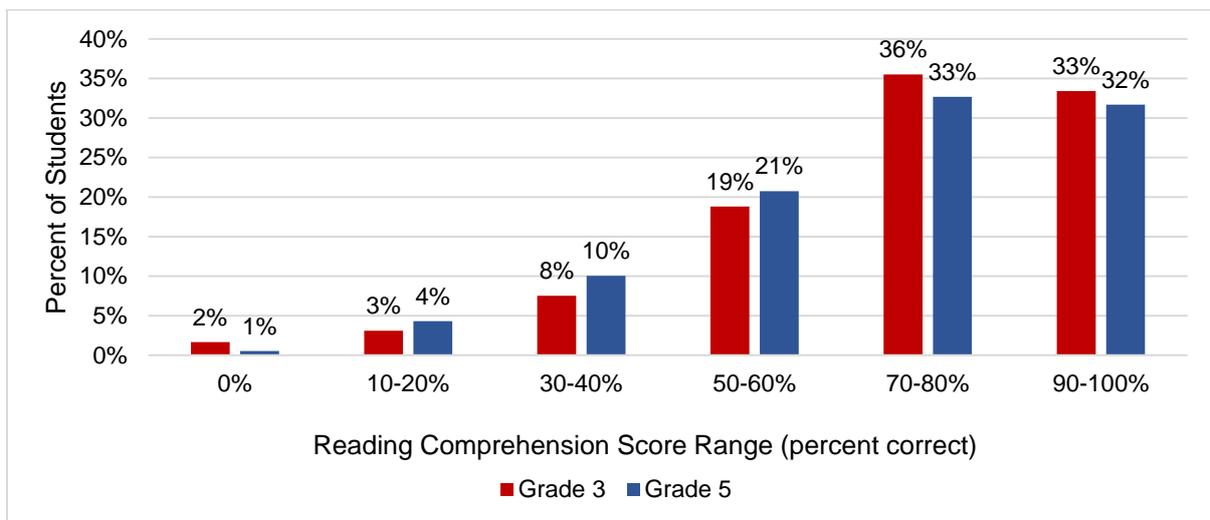


Figure C-3. Distribution of Kyrgyz Oral Reading Fluency Scores for Students in Kyrgyz-Language schools, by Grade

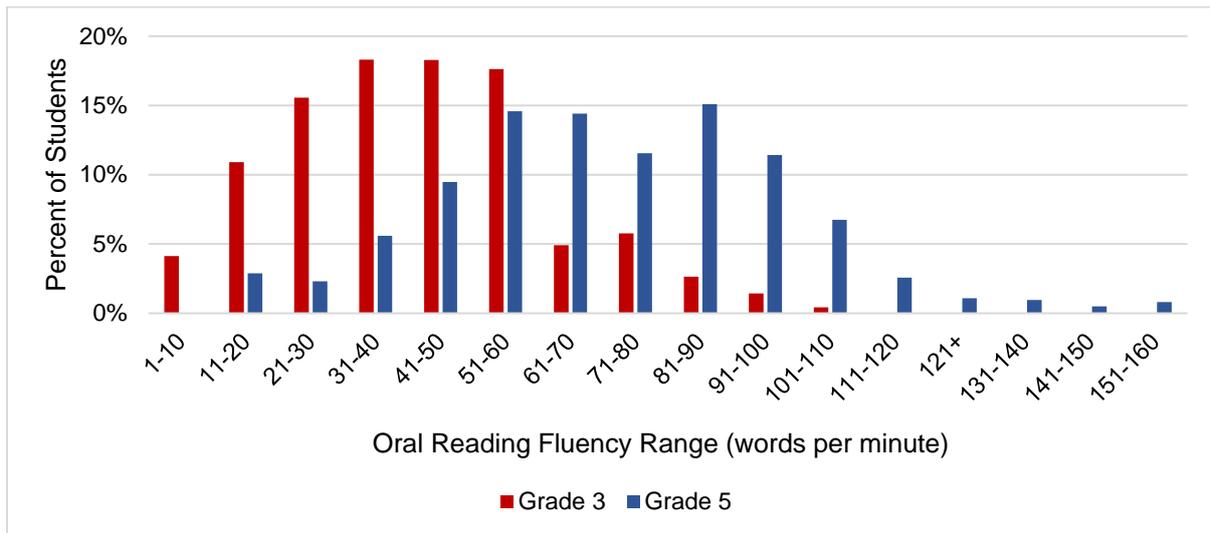


Figure C-4. Distribution of Kyrgyz Reading Comprehension Scores for Students in Kyrgyz-Language schools, by Grade

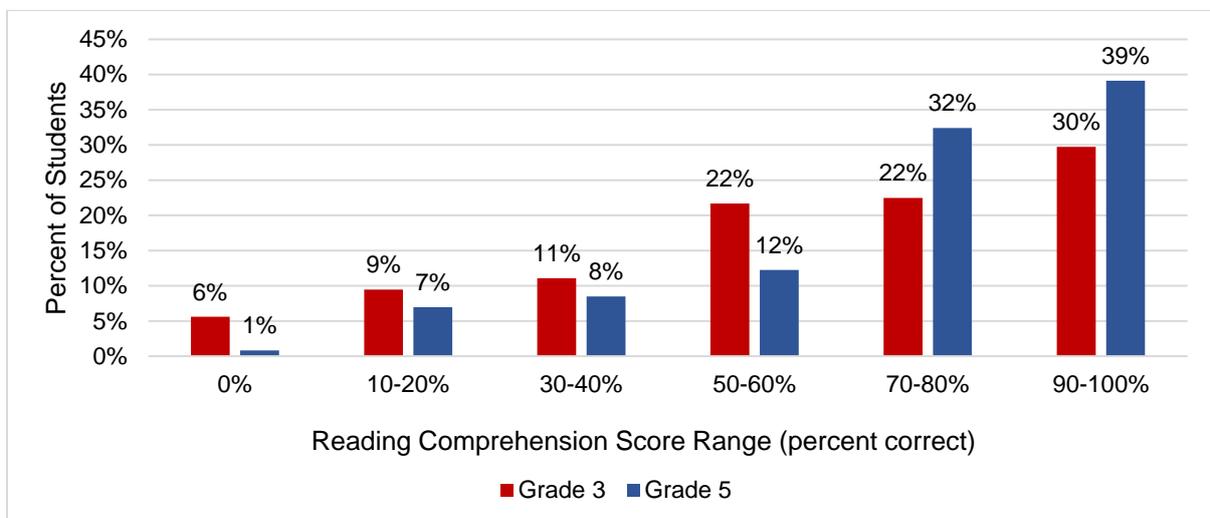


Figure C-5. Distribution of Uzbek L2 Oral Reading Fluency Scores for Students in Kyrgyz-Language schools, by Grade

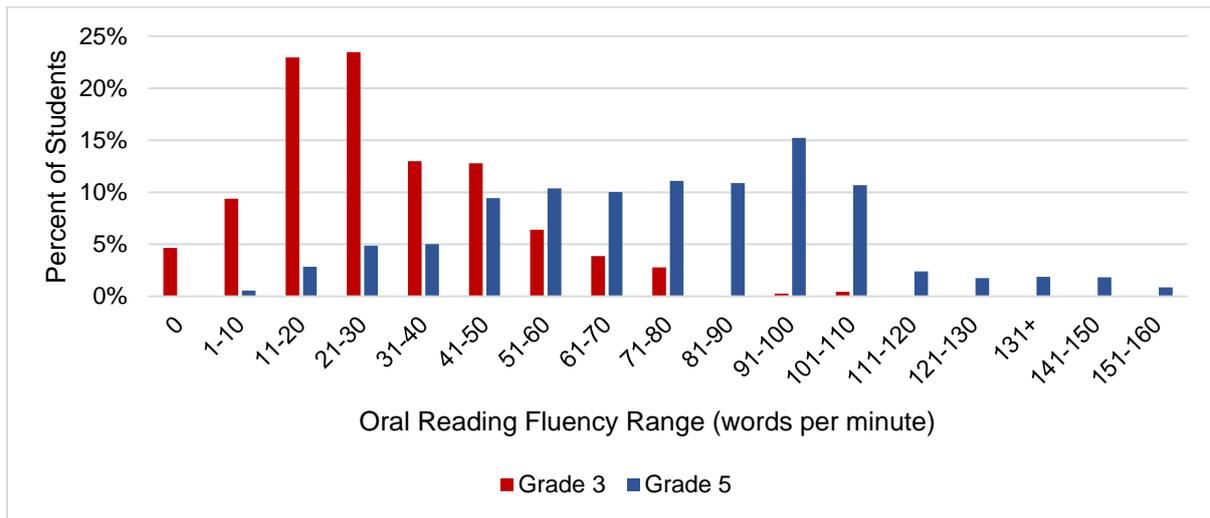


Figure C-6. Distribution of Uzbek L2 Reading Comprehension Scores for Students in Kyrgyz-Language schools, by Grade

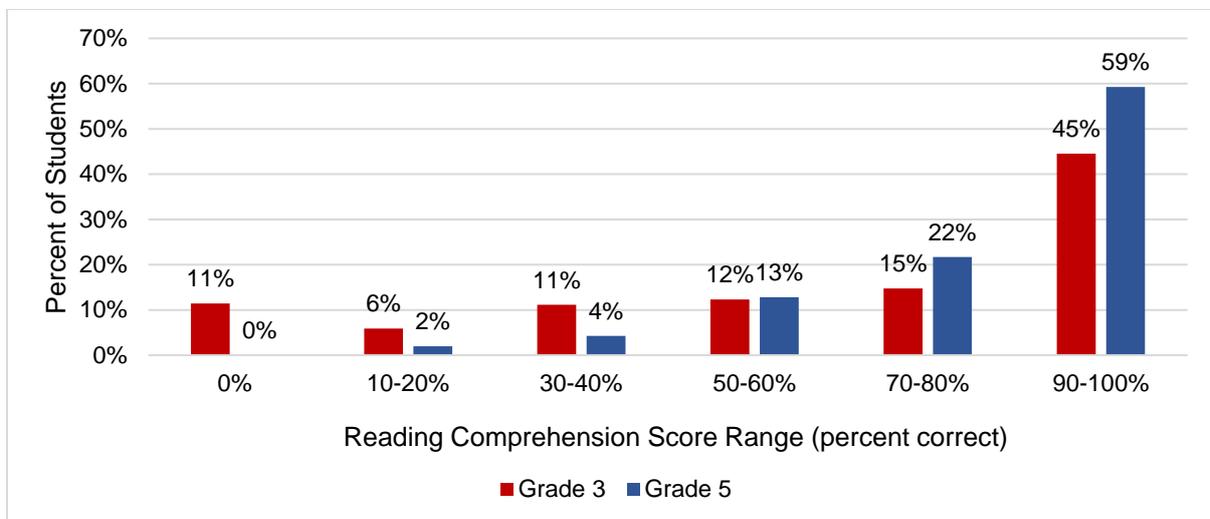


Figure C-7. Distribution of Karakalpak Oral Reading Fluency Scores for Students in Karakalpak-Language schools, by Grade

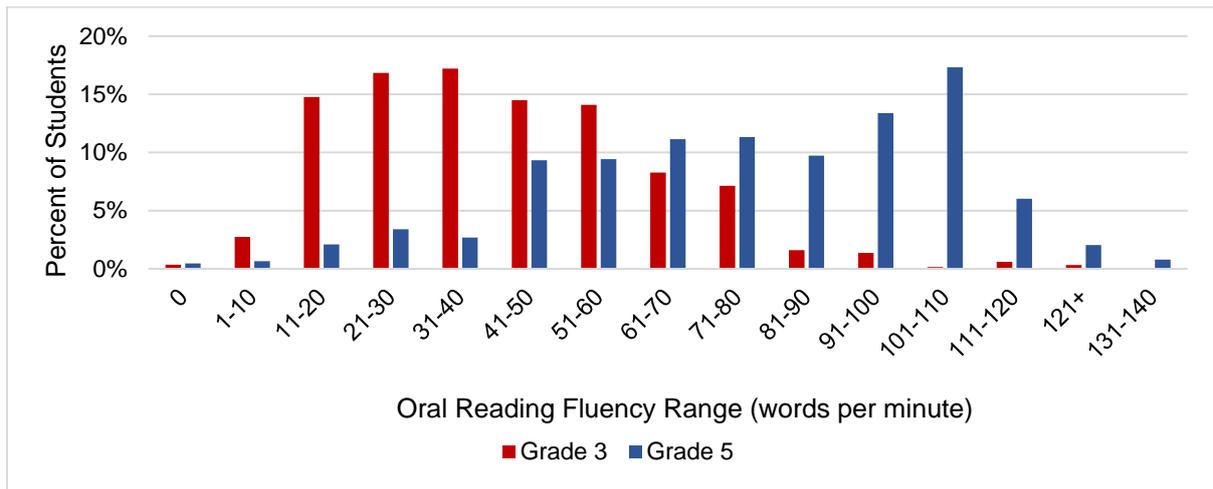


Figure C-8. Distribution of Karakalpak Reading Comprehension Scores for Students in Karakalpak-Language schools, by Grade

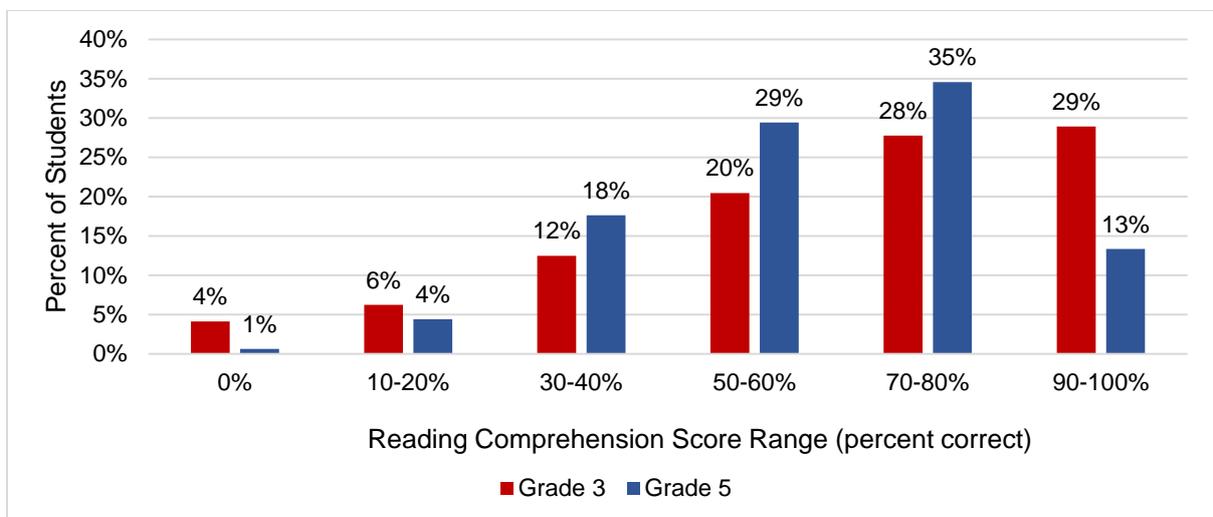


Figure C-9. Distribution of Uzbek L2 Oral Reading Fluency Scores for Students in Karakalpak-Language schools, by Grade

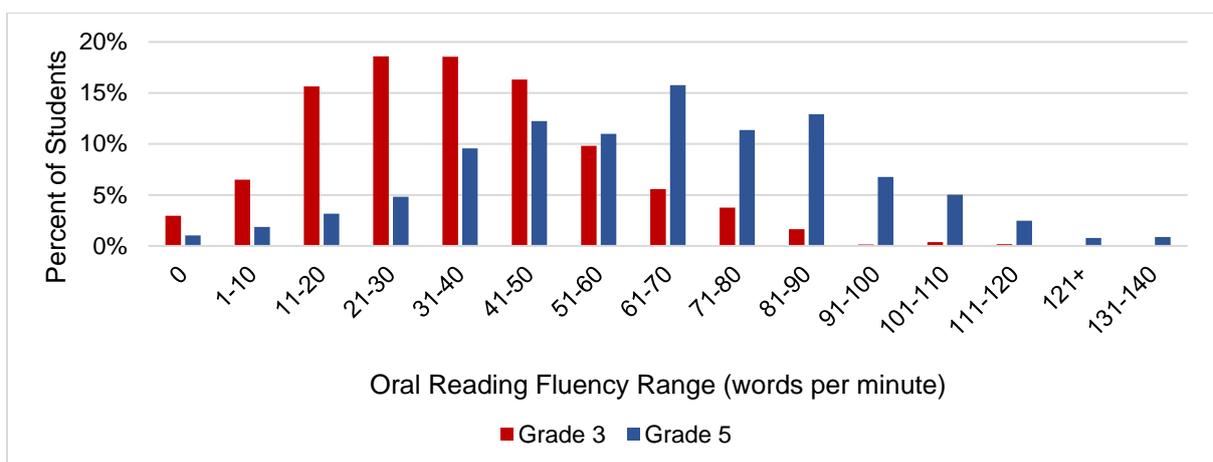


Figure C-10. Distribution of Uzbek L2 Reading Comprehension Scores for Students in Karakalpak-Language schools, by Grade

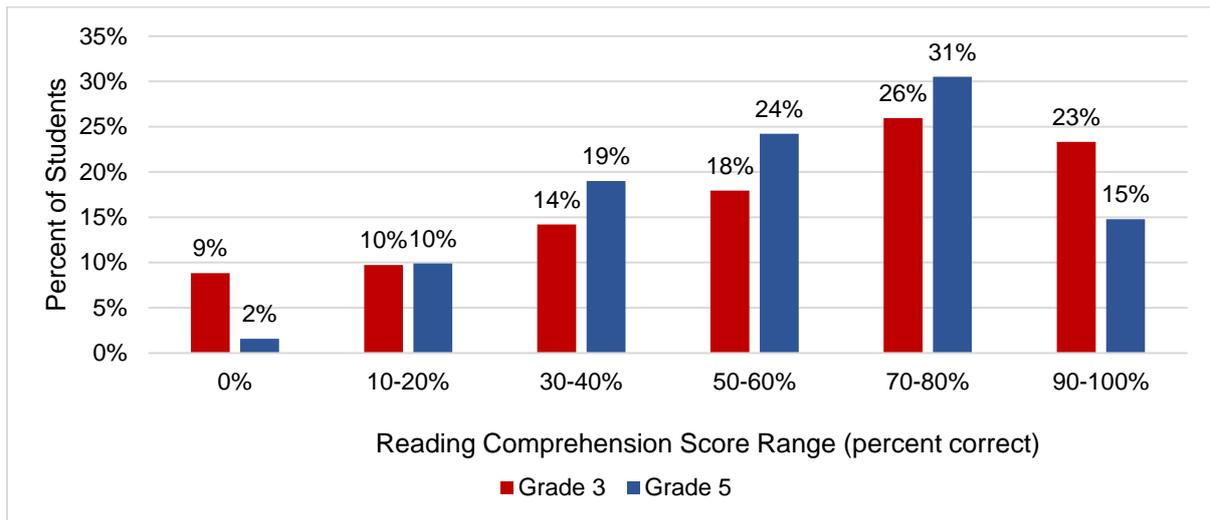


Figure C-11. Distribution of Kazakh Oral Reading Fluency Scores for Students in Kazakh-Language schools, by Grade

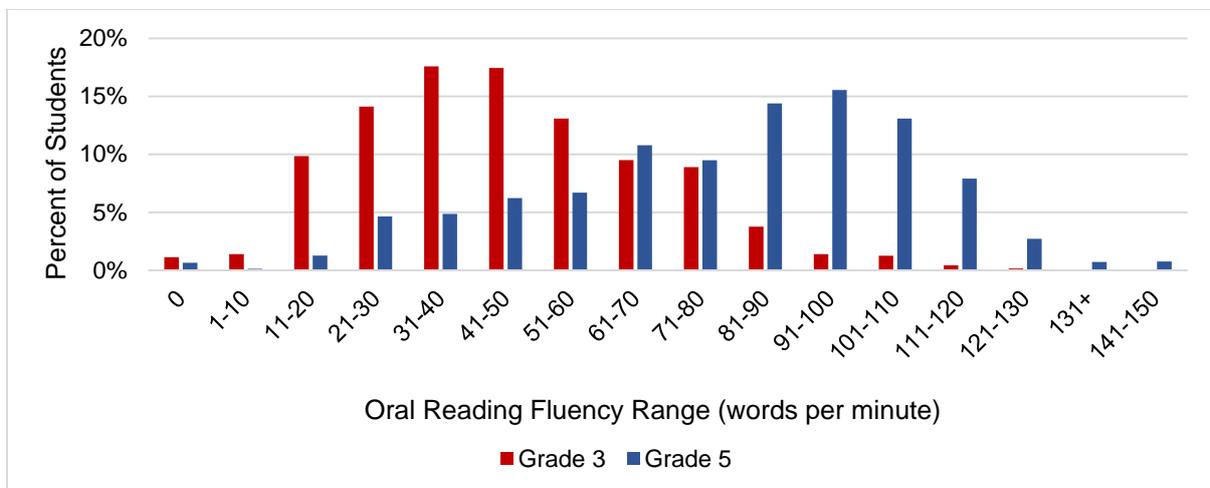


Figure C-12. Distribution of Kazakh Reading Comprehension Scores for Students in Kazakh-Language schools, by Grade

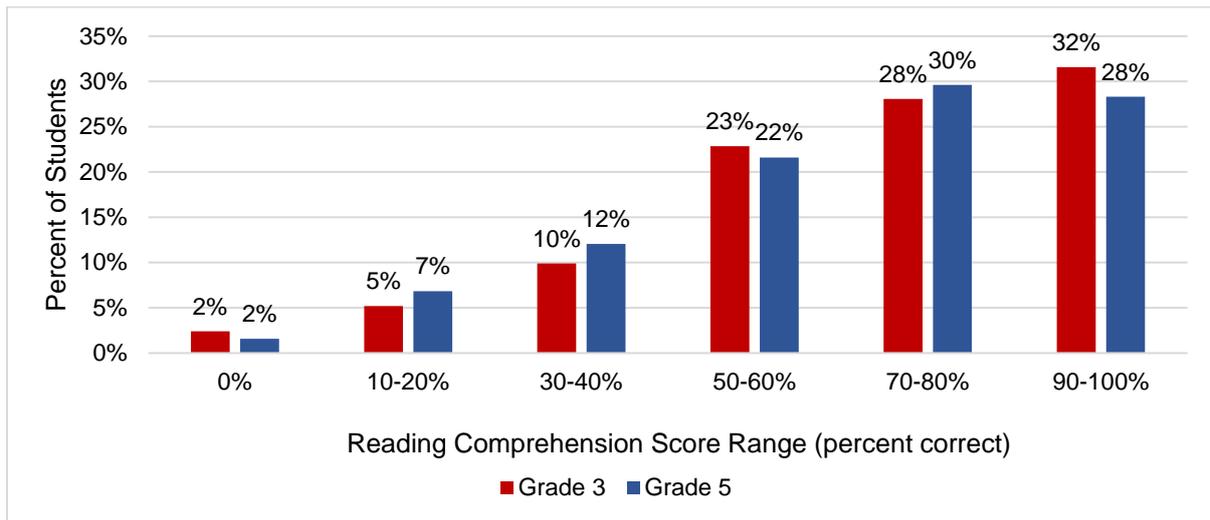


Figure C-13. Distribution of Uzbek L2 Oral Reading Fluency Scores for Students in Kazakh-Language schools, by Grade

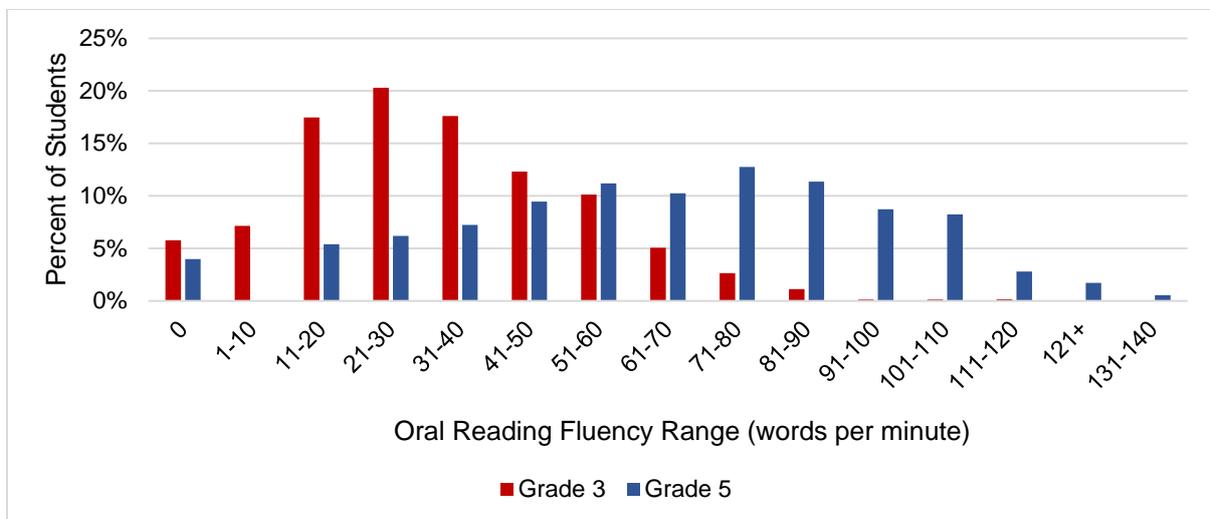


Figure C-14. Distribution of Uzbek L2 Reading Comprehension Scores for Students in Kazakh-Language schools, by Grade

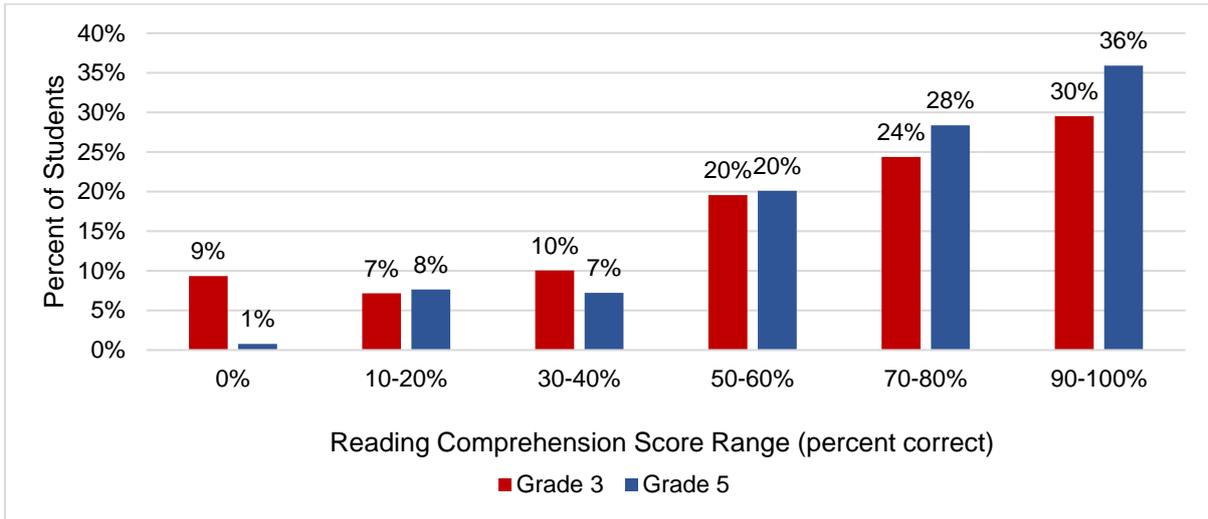


Figure C-15. Distribution of Russian Oral Reading Fluency Scores for Students in Russian-Language schools, by Grade

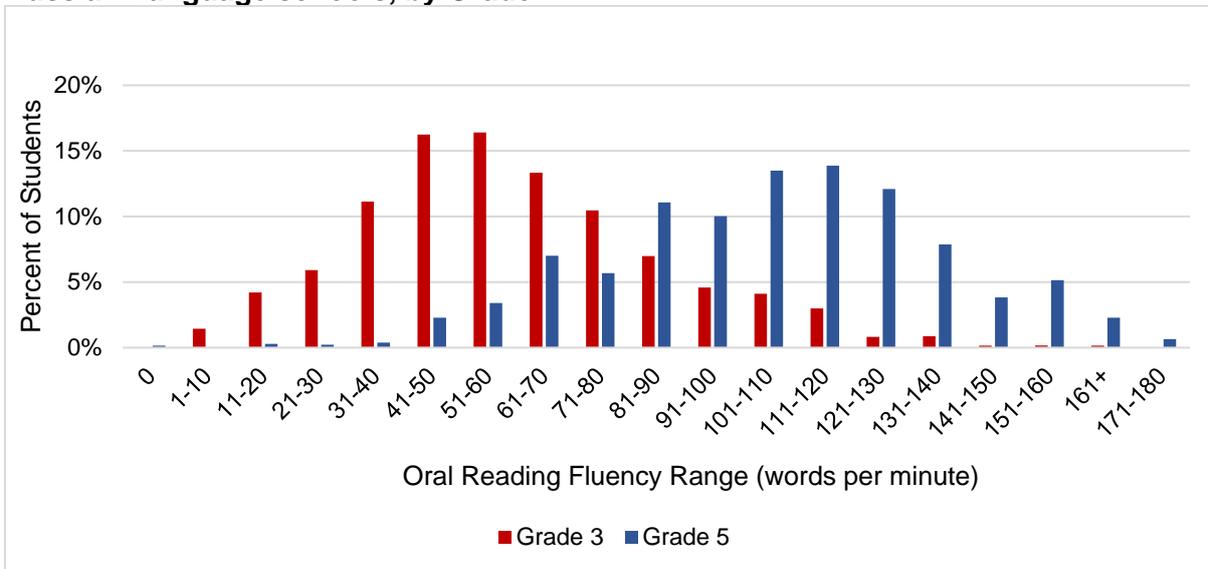


Figure C-16. Distribution of Russian Reading Comprehension Scores for Students in Russian-Language schools, by Grade

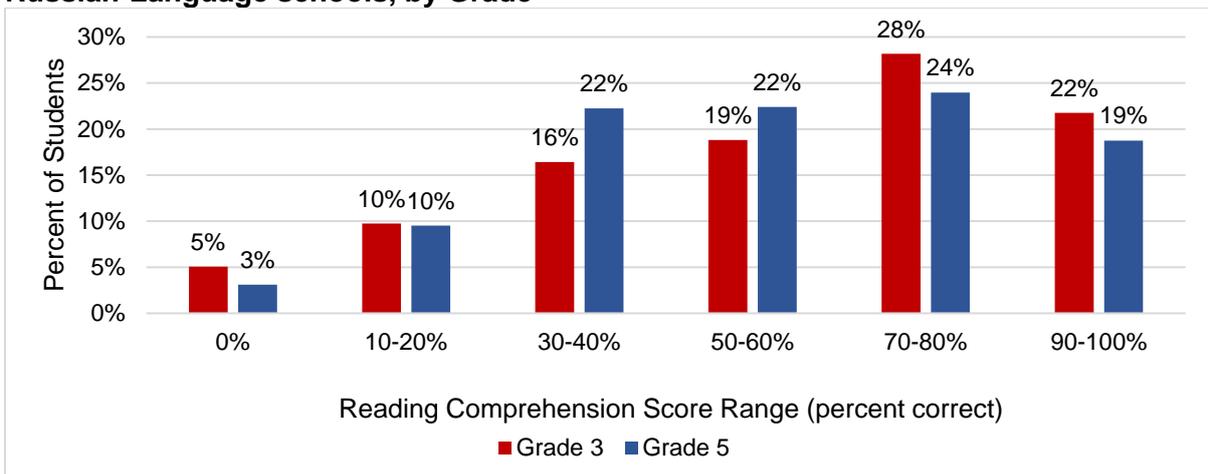


Figure C-17. Distribution of Uzbek L2 Oral Reading Fluency Scores for Students in Russian-Language schools, by Grade

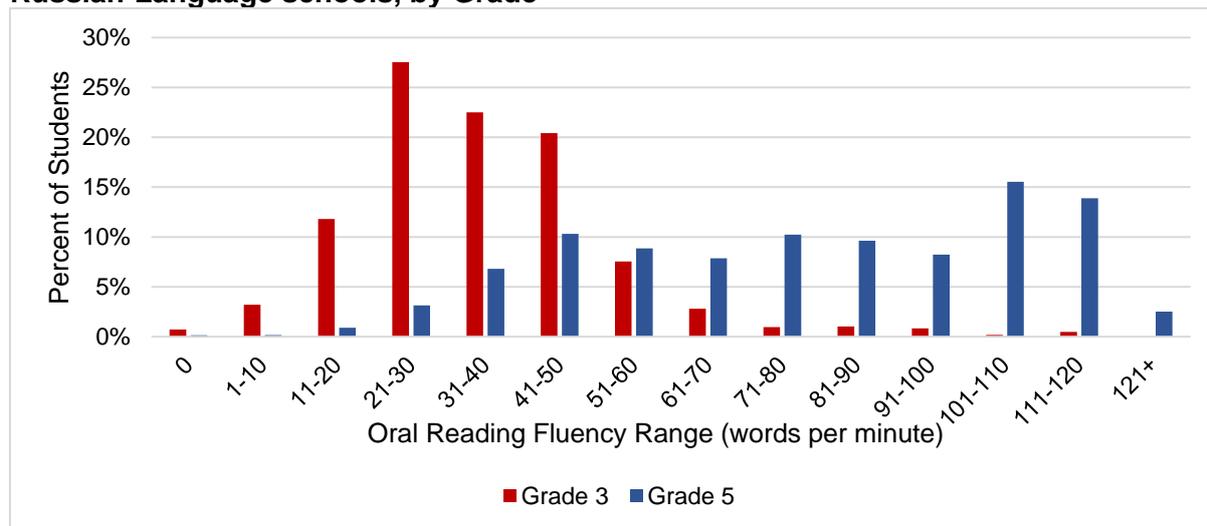


Figure C-18. Distribution of Uzbek L2 Reading Comprehension Scores for Students in Russian-Language schools, by Grade

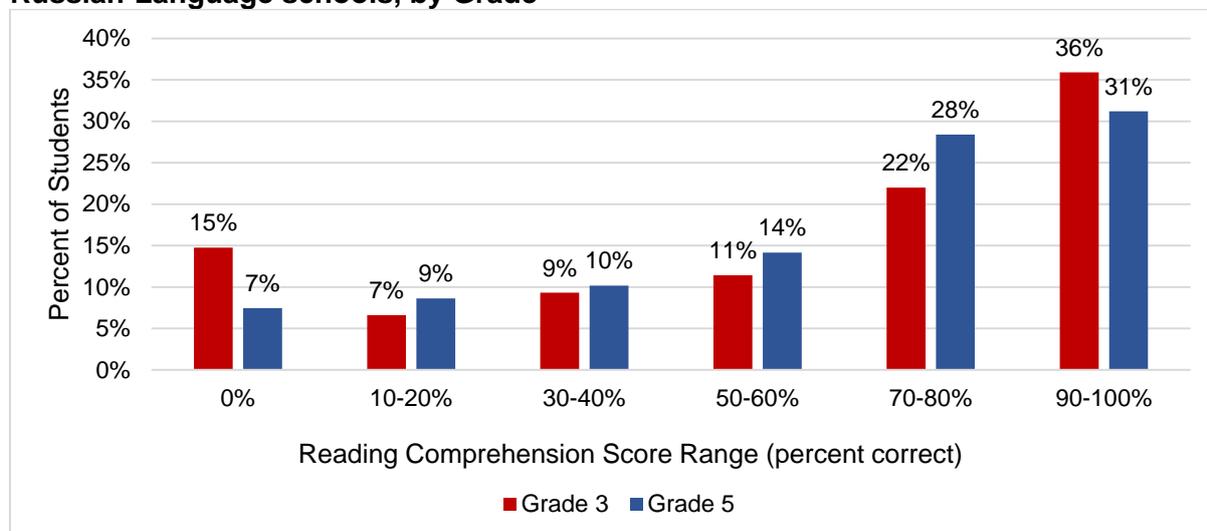


Figure C-19. Distribution of Tajik Oral Reading Fluency Scores for Students in Tajik Language schools, by Grade

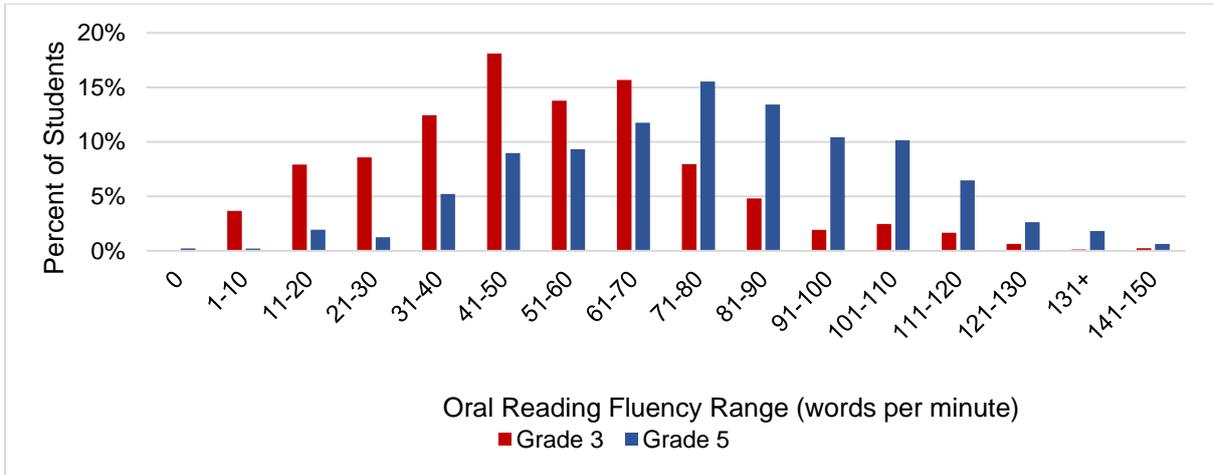


Figure C-20. Distribution of Tajik Reading Comprehension Scores for Students in Tajik-Language schools, by Grade

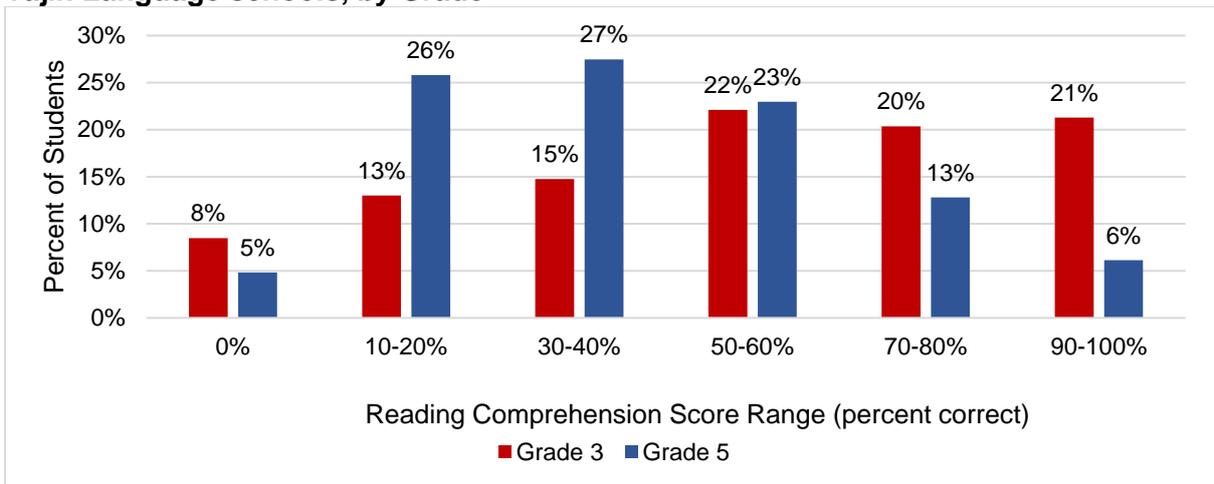


Figure C-21. Distribution of Uzbek L2 Oral Reading Fluency Scores for Students in Tajik-Language schools, by Grade

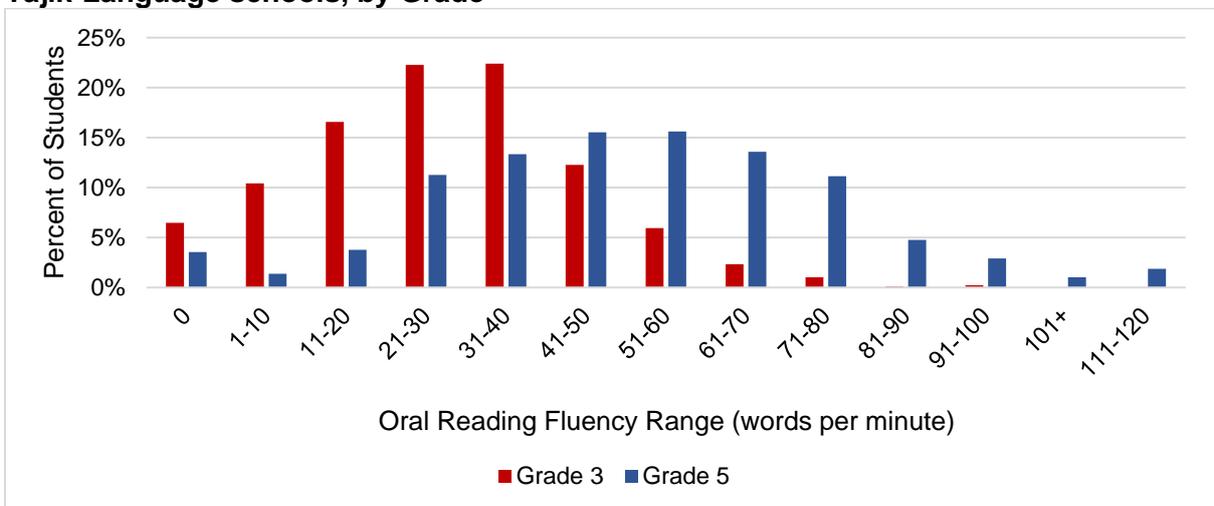


Figure C-22. Distribution of Uzbek L2 Reading Comprehension Scores for Students in Tajik-Language schools, by Grade

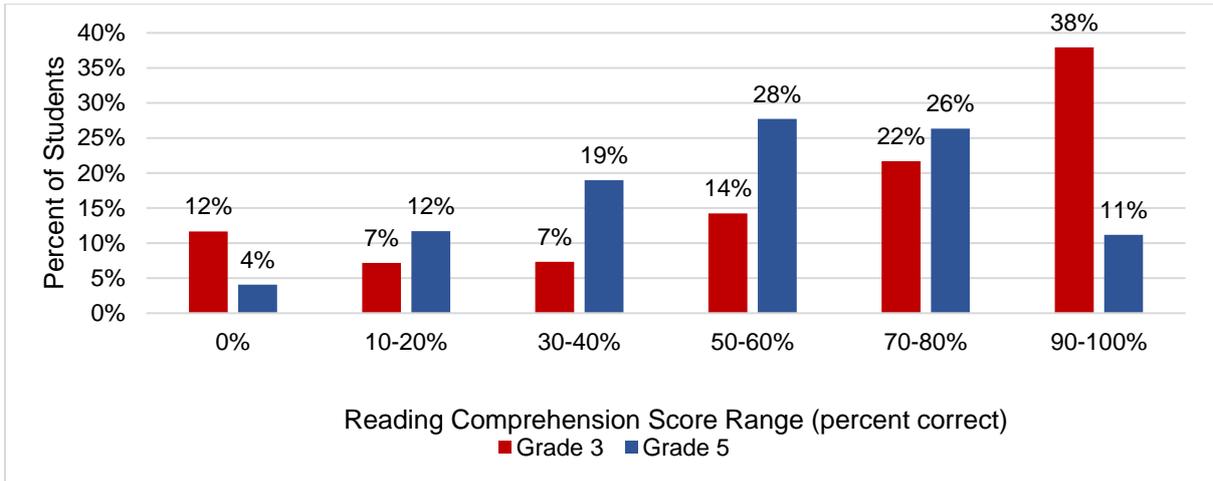


Figure C-23. Distribution of Turkmen Oral Reading Fluency Scores for Students in Turkmen-Language schools, by Grade

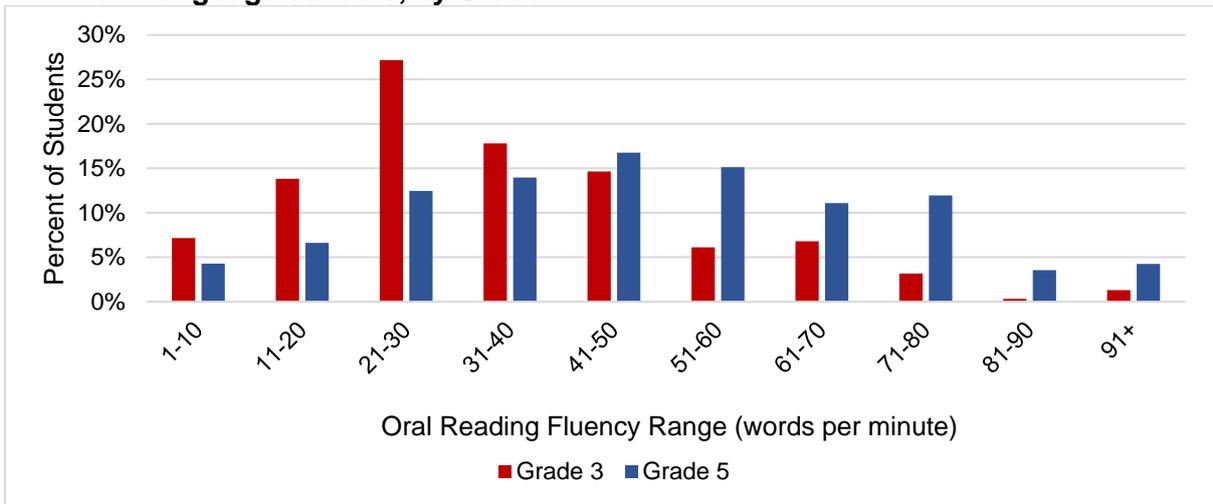


Figure C-24. Distribution of Uzbek L2 Oral Reading Fluency Scores for Students in Turkmen-Language schools, by Grade

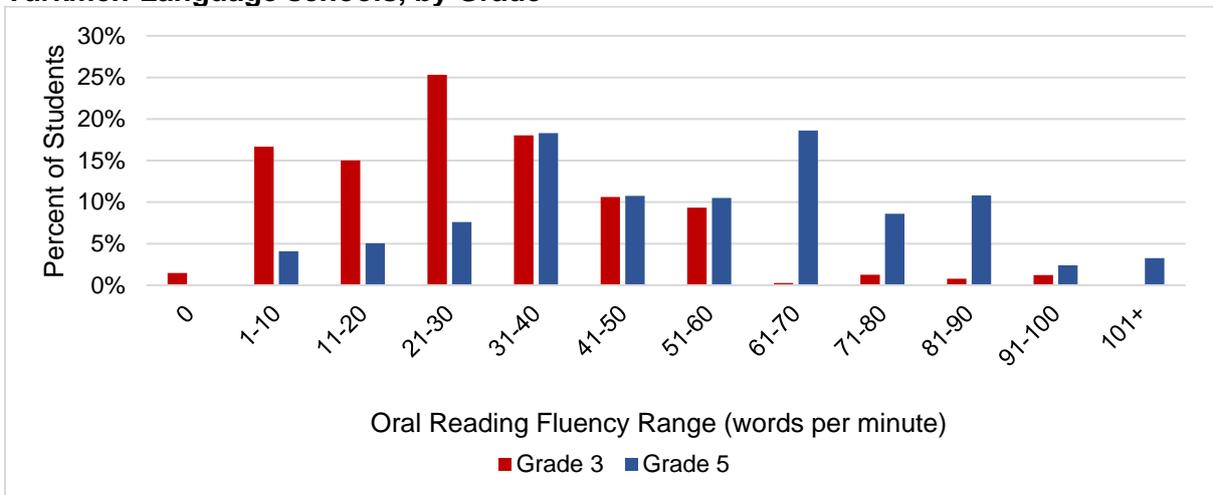


Figure C-25. Distribution of Turkmen Reading Comprehension Scores for Students in Turkmen-Language schools, by Grade

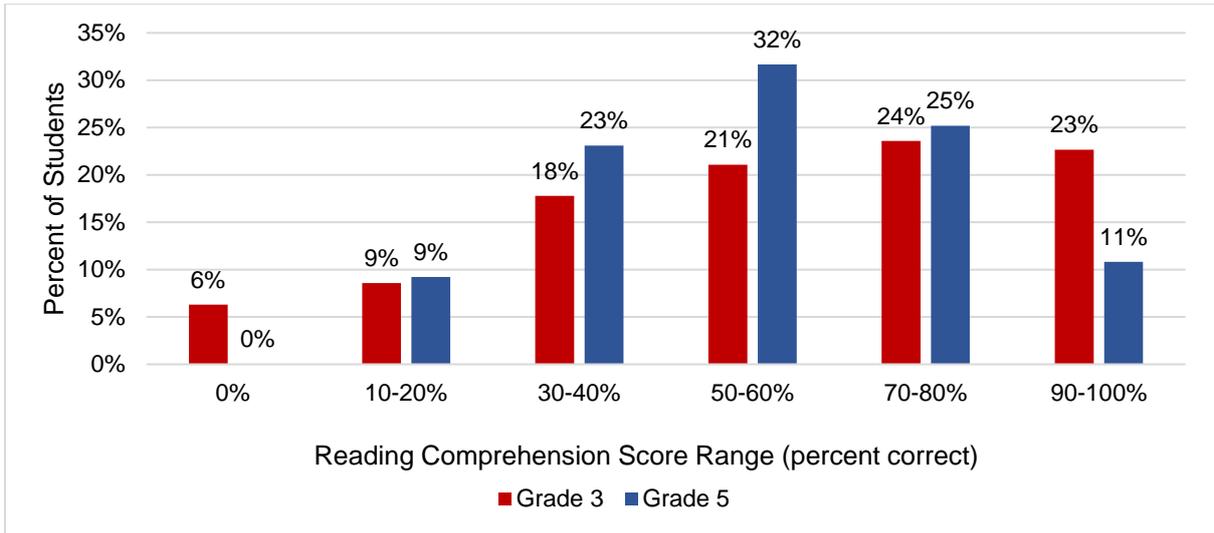
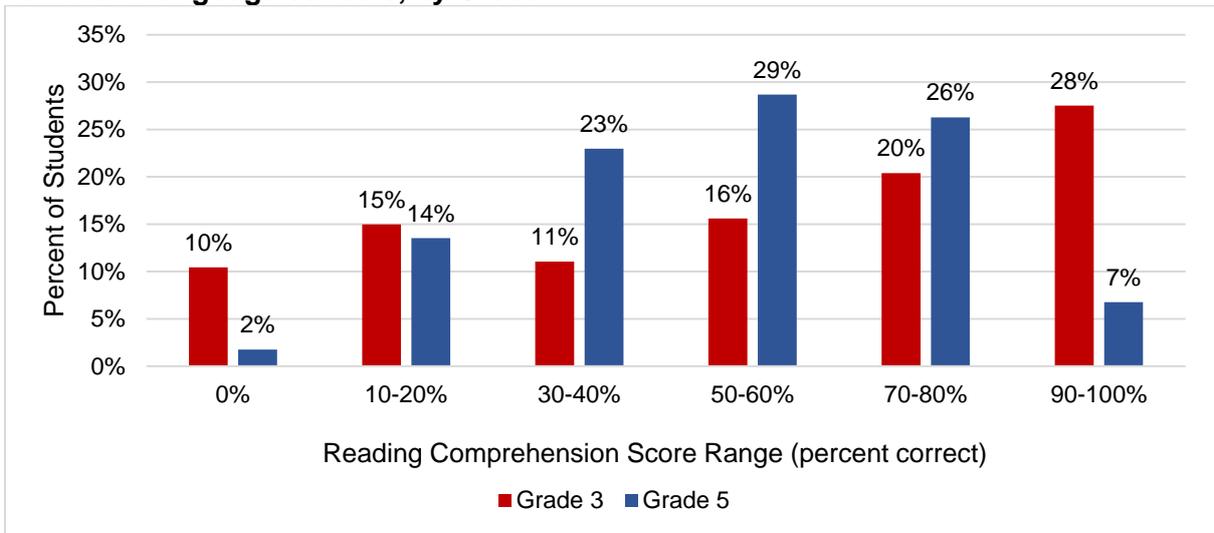


Figure C-26. Distribution of Uzbek L2 Reading Comprehension Scores for Students in Turkmen-Language schools, by Grade



Annex D: Factors Associated with Higher Scores in Oral Reading Fluency and Math

Regression models were used to investigate factors associated with higher learning outcomes in reading as measured by the oral reading fluency rate (correct words read per minute [cwpm]). After controlling for basic student demographic characteristics (gender, over-age, urban/rural, SES, and the match between the student’s home language and the language instruction, several variables showed statistically significant correlations with reading performance (**Table D-1**). Grade 5 students who reported being absent more than once the previous week read on average 6.8 fewer cwpm on the oral reading fluency task than those who were not absent. Students who reported studying every day during school closures read on average 10.4 more cwpm when compared to students who did not learn or study. Likewise, students in urban schools read on average 4.3 more cwpm than students in rural schools, and females read on average 8 more cwpm than males. Being over-age, having a home-school language match, and not being in the bottom 10th percentile for socioeconomic status were all also correlated with higher reading fluency rates (3.9, 5.3, and 3.9 cwpm respectively).

Table D-1. Factors Associated with Higher Oral Reading Fluency in Grade 5

Variable	Value	n	Beta	p-value
Was the student absent at least once the week prior to school visit	No [^]	7309	0	
	Once ^{***}	1482	-4.67	0.000
	More than once ^{***}	1365	-6.75	0.000
[While schools were closed], how often did you sit to learn and study?	I did not learn nor study [^]	298	0	
	Once a week or less ^{***}	573	8.18	0.000
	Every day ^{***}	7493	10.44	0.000
Urban school?	Rural [^]	6389	0	
	Urban ^{***}	3767	4.28	0.000
Is the student female?	Male [^]	5093	0	
	Female ^{***}	5063	8.03	0.000
Is the student above the grade age? Age>9 G3; Age>11 G5	Not [^]	9239	0	
	Above Age ^{**}	917	3.93	0.009
Is the child's home language the same as the one he/she was assessed in?	Different Languages [^]	919	0	
	Same Language ^{***}	9237	5.32	0.000
Is the student in the bottom SES decile?	Bottom 10th Percentile [^]	1147	0	
	Not-Bottom 10th Percentile ^{***}	9009	3.91	0.000

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; [^] reference

Regression models were also applied to the Grade 5 learning outcomes in math, as measured by the percentage correct in the overall score. As with reading fluency, the results of the regression analysis showed that certain variables were statistically correlated with higher performance in math (**Table D-2**). For example, Grade 5 students who reported having missed more than one day of school the previous week scored on average 10.2 percentage points less than students who had not been absent. Students who reported studying or doing homework every day when schools were closed scored on average 5.9 percent points higher than students who studied once a week or less. Moreover, the study methods used by students mattered: those who studied at home by watching lessons on TV performed significantly better than those who completed homework by Telegram chat (1.8

percentage points), those who were assigned homework given by a teacher (2.5 percentage points) or family member (4.7 percentage point), or those who studied by themselves (4.9 percentage points). There was no difference in performance between students who watched lessons on TV and those who worked with a tutor.

Table D-2. Factors Associated with Higher Math Scores in Grade 5

Variable	Value	n	Beta	p-value
Was the student absent at least once the week prior to school visit?	No [^]	7323	0	
	Once ^{***}	1465	-7.2	0.000
	More than once ^{***}	1136	-10.18	0.000
[While schools were closed], how often did you sit to learn and study?	Once a week or less [^]	485	0	
	2–3 times a week ^{***}	2028	1.68	0.155
	Every day ^{***}	7411	5.86	0.000
[While schools were closed], how did you study?	I watched the lessons on TV [^]	5721	0	
	I completed homework on Telegram chats [*]	1501	-1.73	0.043
	My teacher assigned me homework ^{**}	874	-2.45	0.016
	A family member gave me homework ^{***}	450	-4.73	0.000
	A tutor gave me homework	122	1.97	0.286
	I read and studied at my home ^{***}	1256	-4.91	0.000
	Language of instruction	Uzbek [^]	7618	0
	Kyrgyz ^{***}	274	14.7	0.000
	Karakalpak	510	-.35	0.779
	Kazakh ^{**}	427	5.03	0.013
	Russian [*]	554	2.93	0.037
	Tajik [*]	365	-5.98	0.019
	Turkmen ^{***}	176	-10.5	0.000

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; [^] reference