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READING ACHIEVEMENT OF CHILEAN SECOND-GRADE STUDENTS AFTER COVID-19[1]

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ABSTRACT

Background: Low levels of reading comprehension have remained persistent in South America, as evidenced by third-grade results from the ERCE. A deeper understanding of the underlying reading subprocesses is essential to addressing reading comprehension lags in the region. Methods: We conducted a diagnostic study to assess the reading skills of a representative sample of Chilean second-grade students from a large metropolitan area. Results: for 60% of students reading comprehension was below the level expected by the end of first-grade. These results cannot be explained by language comprehension alone, since most of those students (63%) had above second grade listening comprehension skills. Instead, low reading comprehension levels seem to be more strongly associated with deficits in frequent word recognition and vocabulary knowledge. Specifically, 88% and 58% of these students, respectively, performed below end-of-first-grade levels. Conclusions: strengthening these specific reading subprocesses is crucial to prevent comprehension deficits as reading tasks become more complex.

Key concepts: Diagnosis; Reading Comprehension; Evaluation.

NIVEL DE LECTURA DE ESTUDIANTES CHILENOS DE SEGUNDO BÁSICO DESPUÉS DEL COVID-19

RESUMEN

Antecedentes: Los bajos niveles de comprensión lectora han persistido en Sudamérica, como lo evidencian los resultados de tercero básico en el ERCE. Por lo tanto, es necesario comprender mejor las etapas que preceden al tercero básico, centrándose no solo en la comprensión lectora, sino también en los procesos subyacentes de la lectura, lo que representa un enfoque innovador para la región. Métodos: Realizamos un estudio diagnóstico para evaluar las habilidades de lectura de una muestra representativa de estudiantes chilenos de segundo básico de una gran área metropolitana que concentra más de 90,000 estudiantes de segundo grado. Utilizando Dialect, una plataforma en línea que evalúa la capacidad de lectura, encontramos que el 60%

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de los estudiantes presenta una comprensión lectora inferior a lo esperado al final de primero básico. Estos resultados no pueden explicarse únicamente por la comprensión del lenguaje, ya que la mayoría de esos estudiantes (63%) tenía habilidades de comprensión auditiva superiores a las de segundo básico. En contraste, los bajos niveles de comprensión lectora parecen explicarse mejor por puntajes bajos en el reconocimiento de palabras frecuentes y en el conocimiento del vocabulario, donde el 88% y el 58% de esos estudiantes, respectivamente, rinden por debajo de los niveles esperados al final de primero básico. Conclusiones: Esto implica que es necesario fortalecer estos procesos subyacentes de la lectura para evitar déficits en la comprensión cuando las tareas de lectura se vuelven más complejas.

Conceptos clave: Diagnóstico; Comprensión de lectura; Evaluación

Implications for Practice

What is known

- The pandemic and the resulting school and preschool closure has been a threat to the development of students across the globe, especially in the development of basal skills such as reading comprehension.
- There is a need to accurately diagnose reading comprehension levels of students to act in a timely manner. A student who faces difficulties in reading comprehension is likely to struggle with learning processes in different disciplines.
- Reading comprehension skills are a result of the interaction between different subprocesses, such as listening comprehension and vocabulary meaning knowledge.

What this paper adds

- This paper diagnoses the reading comprehension level of second-grade students in Chile using an adaptive and automated assessment that determines in which reading subprocess students are facing difficulties.
- The report analyses students' performance in each reading subprocess, offering a diagnostic approach that enables a precise and detailed assessment of their development This is the first time such an analysis has been conducted in the country using a sample representative of its most populated region .
- Analyzing how these sub-processes operate helps to a better understanding of the underlying reasons for poor comprehension and to identify improvement areas.

Implications

- It is crucial for policy makers to have a baseline understanding of reading levels to make informed decisions and monitor the impact of implemented policies. Additionally, understanding students' development in specific reading sub-processes allow policy makers to implement targeted and timely interventions to improve overall reading proficiency.

- The detailed data from this assessment can help teachers plan instruction to tackle specific reading challenges while ensuring that critical aspects of reading are automatized. Furthermore, such data is useful to design focus ed educational policies that maximize their impact on learning outcomes.
- This type of automated tool can be implemented on a group basis, significantly reducing the time requiredfromteachers compared to traditional assessments.

I. Introduction

School closures due to the pandemic negatively affected students' performance, particularly in reading comprehension skills. There is wide evidence supporting this. For example, Tabullo et al. (2023) studied the impact of the pandemic and its restrictions measures on outcomes in higher education in Argentina. The study suggests that the pandemic is associated with poorer comprehension skills level among students. Furthermore, the pandemic has also had a great impact on younger students. Starling-Alves et al. (2023) has shed some light on this issue, showing that covid-19 school closures are associated with a one year gap (delays in students' skills development) in Brazilian students' comprehension and fluency skills.

The pandemic also impacted Chilean students' reading comprehension skills: the percentage of fourth-grade students who read at an adequate level decreased across all socioeconomic levels after the pandemic (Agencia de Calidad, 2023). A student who has difficulties reading and understanding texts will also struggle with learning across school disciplines (Valenzuela et al., 2013; Juel, 1988). This often results in failures that lead to diminished self-esteem, lack of academic motivation and frustration (Butler et al., 1985; Morgan et al., 2012).

However, reading skills in Chile were at low levels even before the pandemic. A 2017 National Reading Study estimated that 62% of a sample of second-grade students did not comprehend second-grade level texts and were therefore unprepared to face the reading demands of third-grade texts (Agencia de Calidad, 2017). The 2018 PISA assessment placed Chile among the OECD countries with lowest

levels of reading comprehension (OECD, 2018). Chilean students scored 452 points in the reading test, which was higher than the average of Latin American countries (407 points) but lower than the OECD average (487 points). That year, 32% of students performed below level 2 in reading, indicating that they do not meet the basic skills needed to function efficiently and they cannot, for example, identify the main idea in a text.

The losses in the learning process due to school closure is enormous. Findings show that the proportion of Fourth grade students who finish fourth grade at the expected reading level decreased from 45% in 2018 to 40% in 2022, which is equivalent to 20% of a year's worth of learning (Agencia de Calidad, 2023). These results do not show the total impact of the pandemic, since 2022 already considers a year of learning recovery after the effects of COVID-19. However, it does not consider that absent students, for whom information is not available, were twice as many in 2022 than in previous years (9.5% of the total cohort), and the socioeconomic achievement gap, which had been reducing prior to the pandemic, increased.

Assessing second graders is essential for at least two reasons. The first is that by the end of this grade, early oral reading and comprehension skills should be consolidated, since in the first two years of elementary education there is greater potential for these skills to develop. Second, evidence shows that a lag in these skills in the first years of schooling tends to remain chronic throughout the school years, reducing the opportunities for development and well-being of each child in the short and long term (Valenzuela et al., 2013). A study by Juel (1988) shows that students who showed reading difficulties at the end of first grade and did not receive support to be autonomous readers, had an 88% probability of continuing with reading problems in fourth grade. For this reason, identifying and addressing reading difficulties early is crucial.

The purpose of this study is to provide updated information on the reading skills of second-grade post-pandemic students. This baseline will help the design of public policies aimed at post-pandemic reactivation and the development of reading in general. We

chose a diagnostic approach using an online assessment platform that allows us to examine performance on different reading subprocesses and to better understand why each student is at a low comprehension proficiency level (Davidson et al., 2018). We decided to use the Dialect assessment platform because this tool is designed so that all students who are underperforming in reading tasks are further evaluated in other specific reading subprocesses, which allows us to discover in which step (or steps) of the reading process they are failing. This information provided by the Dialect assessment platform is valuable because it helps us to understand whether students who cannot comprehend grade-level texts have fully developed other reading subprocesses required for comprehension, so that we can design focalized policies that can maximize the impact in learning. Furthermore, this kind of detailed analysis hasn't been previously performed to a representative sample in Chile, so it will provide new and meaningful insights for the national education system.

We selected a large metropolitan area that concentrates most second-grade students in the country (39% of national school enrollment). Likewise, according to SIMCE 2018, this region is home to the largest number of students who finish fourth grade with a high reading gap (28,252 students, 27% of the region's school population). By restricting the sample to this region, it is possible that the results show higher reading levels than the country's reality, because this area has historically performed above other regions. Similar results were found by SIMCE 2023, where the average reading score of the region (271.1 points) was higher than the rest of the country's (265.6 points). Despite concentrating 39% of the national enrollment, this urban region contains only 30% of the students enrolled in low reading performance schools according to SIMCE 2022. Thus, the study results may show a more optimistic vision. It is important to consider that the study is a diagnostic snapshot of the reading performance of Chilean second-grade students and does not aim at estimating the effects of the pandemic. The latter is not possible to do with these data since there is no representative measurement at the regional/national level which can serve as pre-pandemic comparison scores.

II. Reading comprehension and reading subprocesses

Reading comprehension is the ability to construct meaning from a printed text (RAND, 2002). It is also the result of the interaction of several subprocesses, such as print knowledge, phonological awareness, word reading accuracy, vocabulary, and general language processing (Francis et al., 2006). Different theoretical models that explain reading comprehension, such as the simple model (Gough & Tunmer, 1986) or its more granular depiction in the rope model (Scarborough, 2001), define reading as the outcome resulting from automatic and strategic articulation of these subprocesses.

Phonological awareness, alphabetic principle, and word reading skills should be acquired and automated early in the process of reading acquisition because they consume considerable amounts of cognitive energy. Once these subprocesses are automated, that cognitive energy can be deployed and used in meaning construction processes (Dehaene, 2009). Language comprehension processes, on the other hand, are used strategically; that is, readers select among a variety of components such as prior knowledge, vocabulary, syntactic, linguistic, and/or literary knowledge, the tools that allow them to create a mental representation of the text and construct meaning (Kintsch, 1998; RAND, 2002; Rapp et al., 2007). Evidence shows it is important to develop reading subprocesses adequately to achieve good levels of textual processing and understand a text (National Reading Panel, 2000).

On the other hand, effective reading instruction must be explicit, systematic, and sequenced. Before children master the understanding that written letters represent spoken sounds, readers should develop phonological awareness through oral language games (Vaughn & Fletcher, 2021; Fletcher et al., 2019). At the same time, they begin to build a strong vocabulary and comprehension skills even if they cannot read a text by themselves. More sophisticated comprehension and vocabulary skills can be developed as early as in preschool, since children can make inferences at a very early age (Kendeou et al., 2008).

A thorough screening of reading skills includes understanding how reading subprocesses operate to help readers construct meaning. Diagnostic assessments in the early elementary grades tell teachers more than whether students comprehend a text (Davidson et al., 2018). They should identify a child's strengths and needs in reading to tailor instruction. However, the national assessments applied in Chile only measure reading comprehension as an outcome. This prevents teachers from identifying where difficulties lie, and from understanding why students have deficient reading skills. The last national evaluation for second grade in Chile (2017) estimated that 62% of students did not develop the reading skills necessary to begin third grade. This triggers questions for which information is not available: H ad the students who failed previously developed the skills expected for first grade? Should we focus on the development of reading comprehension in second-grade or is there an earlier problem and the necessary subprocesses were not consolidated in first grade?

Because diagnostic assessments are usually time consuming, online tools that perform assessments can contribute to collect and process reading skills data more effectively. Dialect is an online platform designed to diagnose reading skills in an adaptive way (Orellana & Melo, 2015). Dialect uses a "whole-to-part" model (Cunningham, 1993), based on the assumption that reading comprehension results from the interaction of several reading subprocesses, and comprehension difficulties are often linked to difficulties in any of these subprocesses: phonological awareness, alphabetic principle, decoding, vocabulary, or fluency. Thus, if a student takes Dialect and their comprehension score is below a certain level, the platform automatically assesses other subprocesses that might explain poor comprehension.

Dialect is delivered individually but can be applied to an entire class concurrently. Individual and aggregated reports are produced for each subprocess as soon as all students complete the assessment. Dialect has been validated for Chilean elementary education students, with high rates of concurrent and predictive validity and internal consistency (MetaMetrics, 2019). Dialect uses the Lexile framework

in Spanish to measure text difficulty and comprehension ability[6]. Each student reads a passage and must complete it using inferences; that is, combining prior knowledge with information in the text. As they respond correctly, students are presented with more complex passages. If five consecutive passages are responded incorrectly, the assessment is interrupted, and the platform determines whether the student has reached the Lexile level expected for the specific grade. If the Lexile falls below the expected measure, other subprocesses are assessed, otherwise, the test stops. For example, the second-grade end-of-year Lexile range is 325L to 510L (Appendix A).

The study addresses the following research questions: 1) What is the reading comprehension level of a representative sample of Chilean second-grade students in a large metropolitan region? 2) How do these comprehension levels compare across socioeconomic groups in the region? 3) Which reading subprocesses might be related to these comprehension levels?

Methods

Design and participants.

The study uses a stratified random sampling design.

The Chilean school system includes 3 types of schools which are organized in terms of administrative responsibility. About 36% of students attend public schools, which up until 2022 were managed by local municipalities and are now in the process of being transferred to local educational systems (SLEP). Currently, about 13% of public schools are run by SLEPS. Public and SLEP schools are free. About 55% of students are enrolled in subsidized schools (PS), which are administered by private foundations but receive state fundings. Subsidized schools are also free or low cost but are considered private (Alarcón et al., 2021). A small proportion of the student population (9%) attends private schools (PP) and must pay fees.

6 The Lexile scale is an algorithm based on the semantic and syntactic complexity of a text, so text items are ordered on a scale from lowest to highest Lexile.

Schools are geographically segregated: public schools serve students in the poorest areas of each city. Evidence has demonstrated that there are large inequalities in academic outcomes of students attending these schools. Achievement gaps can be attributed not only to socioeconomic status and cultural capital, but also to differences in the quality of instruction across different types of schools.

We invited 68 randomly selected schools to participate in the study. We made sure they were representative of school types in the region: municipal, SLEP, PP and PS. From these, 39 schools agreed to participate. The final sample included 16 municipal schools, 5 SLEP, 8 PS and 10 PP schools (Appendix B). 1,153 students took Dialect in mid 2023. Students whose parents did not provide consent were treated in the same way as students who were absent. Both observations are considered random attrition. Proportional adjustments were made, given that no other correction methods could be used since we did not have information regarding absent/no-consent student demographics.

On average, test completion across schools amounted to 89% of participants. When we compared school attendance in second grade in 2022 in the region, 89% of students with the highest attendance rate had the highest final grades. Therefore, it seems feasible that the sample shows a higher performance than the school's average student.

Observations were weighted according to the socioeconomic level of the schools based on the classification by Agencia de Calidad in SIMCE 2022, and to the enrollment proportion of each sampled stratum to obtain a proportionally representative sample of second graders in the urban area of the Metropolitan Region. We use data of administrative dependencies obtained from enrollment information for the year 2023 provided by the Ministry of Education (Appendix D).

Table 1 compares the distribution of students in the sample and population of the region. Overall, there are no significant differences between the two groups in terms of SES, school size, cohort size, amount of time the school opened during the pandemic, and SIMCE 2022 reading scores. Gender is the only variable that shows significant differences across groups, with females being a larger proportion of the sample. Girls tend to outperform boys in

reading; thus, female overrepresentation might display better overall reading results for this sample. Table E3 (Appendix E) displays results by gender as reference.

Table 1
Descriptive statistics: second-grade students and adjusted sample by SES and selection probability.

	Urban RM	Adjusted Sample	Difference
Low SES (%)	6	6.7	-0.7
Mid-Low SES (%)	24.9	25.7	-0.8
Mid SES (%)	32.8	31	1.8
Mid-High SES (%)	19	18.7	0.3
High SES (%)	17.3	17.8	-0.5
Days open during pandemic	47	48	-1
Prop. females (%)	49	54	-5*
2nd grade enrollment per school	82	84	-2
School enrollment	982	1,041	-59
4th grade SIMCE reading score	270	266	4

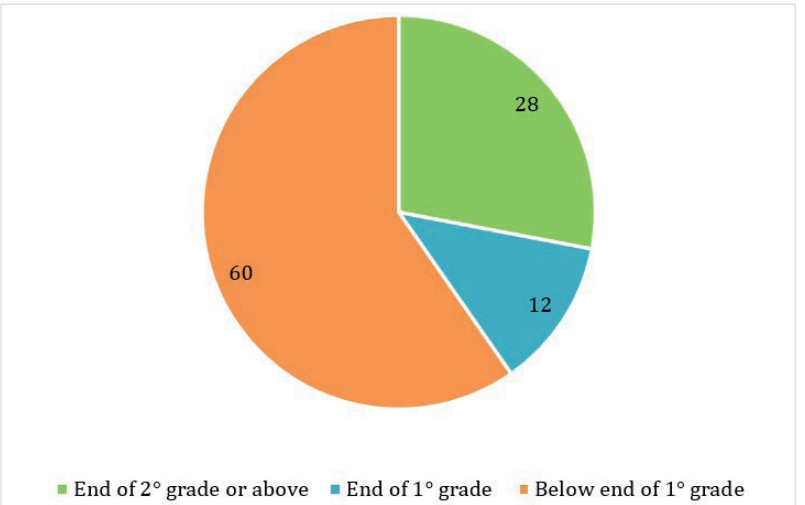
Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Results

Students were assessed at the end of the fall semester, but the expected Lexile levels are estimated for the end of second grade. However, one would expect students' scores to be higher than the end-of-first-grade Lexile range (210L-410L). Thus, a student whose score is lower than 210L would be considered at risk. For easier interpretation, we grouped scores within categories. One category includes students whose scores are above the expected second-grade comprehension level and thus were not tested on subprocesses.

Figure 1 presents the reading comprehension scores. Sixty percent of the participants scored below the end-of-first-grade Lexile scores. Forty percent of students scored above the end-of-first-grade benchmark. Only 28% scored above the end of the second-grade range (325L-510L) and 19% scored above the end-of-third-grade range (445L-605L).

Figure 1.
Reading comprehension scores, second grade: percentage of students in each category.



Note: Estimated results for 2nd-grade students from the urban-area of the Metropolitan Region (98.5% of the region). Sample size 1,153.

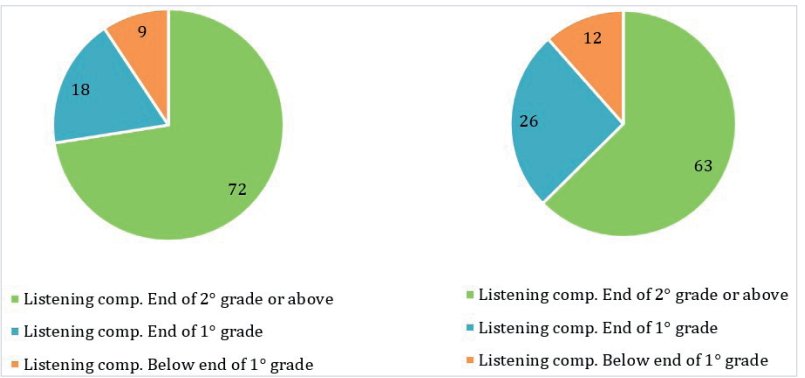
To determine which reading subprocesses presented weaknesses for students with lower comprehension, Dialect assesses listening comprehension, vocabulary knowledge, print knowledge, and word reading. We present these results in the following sections.

1.1 Listening comprehension

Figure 2 shows results from the listening comprehension task, where students listened to a brief narrative or informational text and answered literal, inferential and contextual vocabulary questions. Figure 2b displays results for second-grade students whose reading comprehension scores are lower than the end-of-first-grade benchmark (students that are at a major risk of reading failure). Eighty-nine percent of these students display good listening comprehension. From a diagnostic perspective, it is likely that the main reading difficulties for these students have to do with text processing skills.

Figure 2.
Listening comprehension scores.

a) All students b) All students < end-of-first-grade reading comp. level

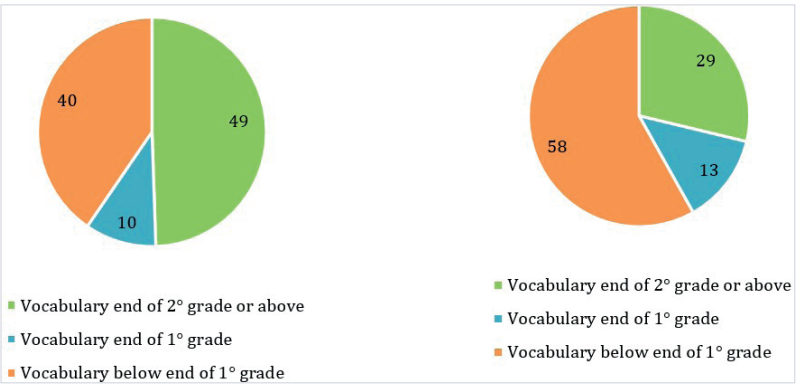


1.2 Vocabulary meaning

Students had to identify the meaning of a word by clicking on one out of four pictures on the screen. Target words and foils were selected from a 3-million-word corpus from textbooks across subjects and grade levels that Chilean students are required to read every year. These words are arranged by frequency as a proxy for word difficulty (Pezoa & Orellana, 2021; Orellana & Pezoa, 2021). Figure 3 displays scores for all students below the end of second grade reading comprehension level (figure 3a), and below the end of first grade (figure 3b). Vocabulary knowledge is at a lower level than listening comprehension. Forty percent of students show vocabulary delays (figure 3a) and 58% of them had comprehension delays as well (figure 3b). Low vocabulary levels might explain the difficulties in reading comprehension for these students, as not knowing the meaning of a word prevents them from creating adequate mental representations of the text, which is key for inference making.

Figure 3.
Vocabulary scores.

a) All students b) All students < end-of-first-grade reading comp. level

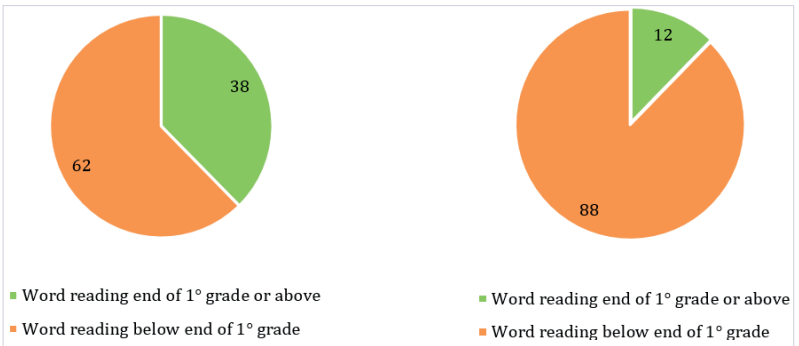


1.3 Word reading

Figure 4 shows results for word reading. Students had to identify the written word they heard from sets of three high-frequency words. Most students are expected to acquire decoding skills of high frequency words at the end of first grade, so four points or more is considered a "within first-grade level." Sixty two percent of students scored below the first-grade level, being in the middle of second grade. Furthermore, 88% of students whose reading comprehension is low scored below first-grade in decoding. This means that it is highly probable that students with low comprehension also struggle with word decoding and are therefore at risk of not being able to understand academic texts.

Figure 4.
Word reading.

a) All students b) All students < end-of-first grade reading comp. level

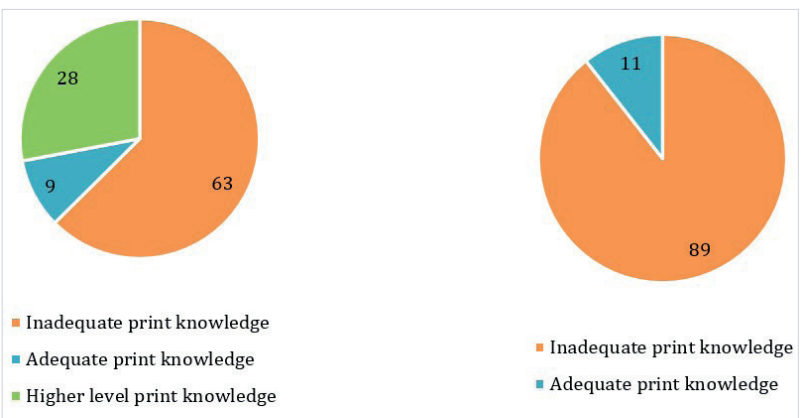


1.4 Print knowledge

In this test, students must identify different features of printed texts such as book title, author, illustrator, punctuation marks and capital versus lower case letters. Here, 63% of students show a low level of print knowledge and 89% of students who struggle with comprehension also show poor print knowledge skills.

Figure 5.
Print knowledge.

a) all students b) All students < end-of-first-grade reading comp. level

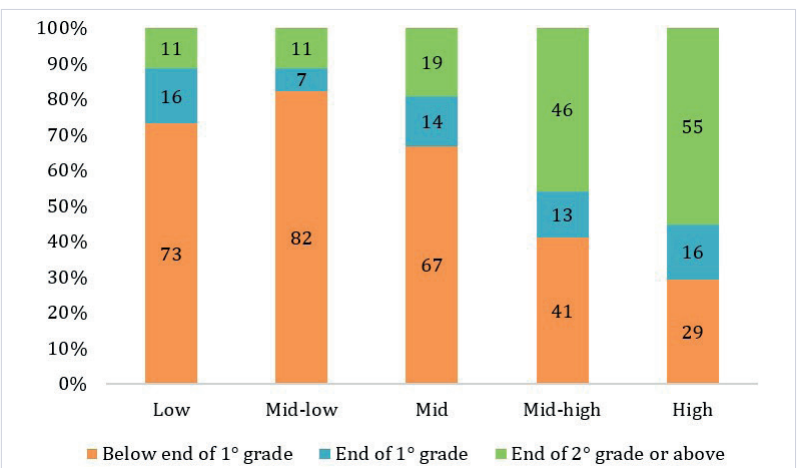


2. Reading comprehension and SES

To further understand these results, we analyzed them by socioeconomic level. This would allow us to determine heterogeneity across groups. We report results using the SES categories assigned by the Agencia de Calidad de la Educación (Chile's Agency for Educational Quality Assurance) in their 2022 school results report. There are five socioeconomic groups: high, mid-high, mid, mid-low, and low. The low and high groups comprise approximately 24% of total school enrollment.

As SES increases, there tends to be a lower proportion of students who struggle with comprehension (i.e., below end-of-first-grade Lexile benchmark) and a higher proportion who surpass the end-of-second-grade benchmark, so we may conclude that reading comprehension ability tends to increase with the socioeconomic level (Figure 6). However, the percentage of students who do not reach the end-of-first grade Lexile scores is high across socioeconomic groups, indicating that there is a significant delay in reading ability even among high SES students.

Figure 6.
Reading comprehension by SES.

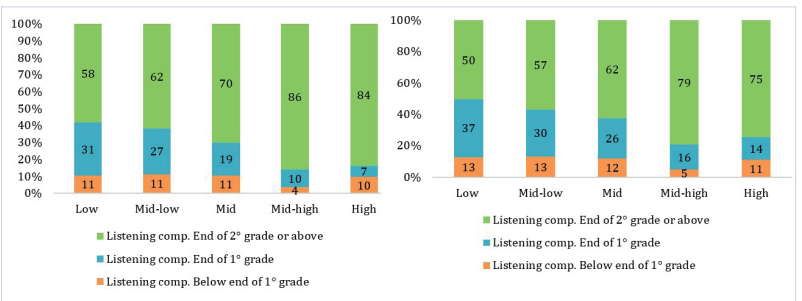


N= 1,153: 144 students from low SES, 284 from mid-low SES, 301 from mid SES, 175 from mid-high SES and 249 from high SES.

2.1 Listening comprehension

Less than 15% of students have low levels of listening comprehension (figure 7a) across SES groups, and the same is true for students whose comprehension level falls below the end-of-first-grade level.

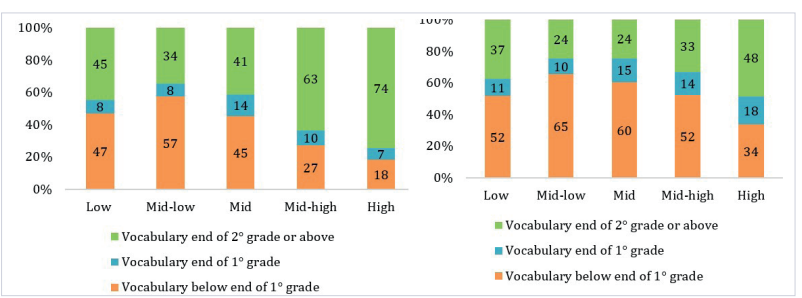
Figure 7.
Listening comprehension by socioeconomic group.
a) All students b) All students < end-of-first grade reading comp. level



2.2 Vocabulary meaning

In general, vocabulary scores are lower than listening comprehension scores across socioeconomic groups. Figure 8b shows that among students with more severe reading difficulties, all students, regarding the SES, also struggle with vocabulary meaning.

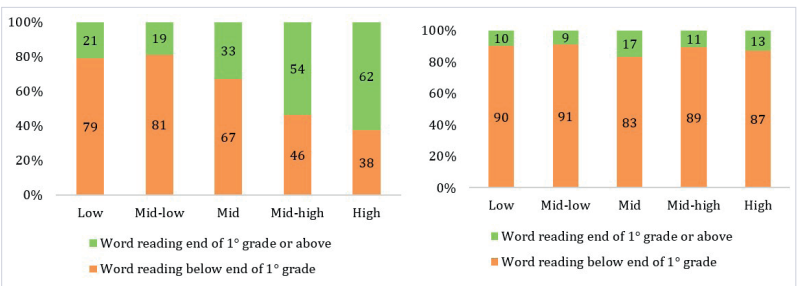
Figure 8.
Vocabulary meaning scores by socioeconomic groups.
a) All students. b) All students < end-of-first grade reading comp. level



2.3 Word reading

There is a considerable proportion of students whose word reading skills are still below the expected ability level for the end of first grade, and this can be observed across socioeconomic groups (figure 9a). Figure 9b shows how word reading is low for almost all students who show a delay in reading skills, across socioeconomic groups. In fact, more than 80% of students with low reading ability also struggle with word reading.

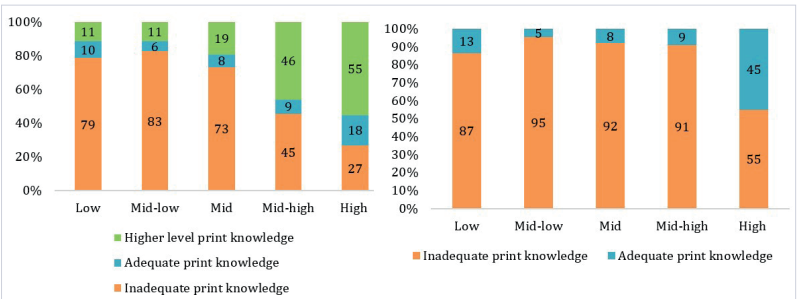
Figure 9.
Word reading skills by socioeconomic groups.
a) All students. b) All students < end-of-first grade reading comp. level



2.3 Print knowledge

Figure 10 shows results for print knowledge (reported in terms of expected results for the end of second grade). Results are similar across groups, with more than 70% of students falling below expected levels. High SES students show better results than the other groups with 27% of students at the lowest level of performance (figure 10a). However, there is a high number of students with poor print knowledge across all SES. Figure 10b shows that most students with low reading scores also show low levels of print knowledge across SES, with a smaller proportion of struggling students in the high SES group.

Figure 10.
Print knowledge results by SES groups.



In summary, findings show that SES is an important predictor of students' reading ability, both at the overall reading comprehension and reading subprocesses levels. Major delays occur at the word reading level, where almost all students who struggle with comprehension across SES groups require additional support. For other reading subprocesses, there are differences between students who lack comprehension skills in high SES compared to other socioeconomic groups.

Conclusions

The purpose of this study was to provide updated information on the reading skills of second-grade post-pandemic students, to contribute to the design of informed public policies aimed at post-pandemic reactivation and the development of reading in general. Results from the Dialect assessment show that 3 out of 5 second-grade students who participated in the study have low reading comprehension levels and do not even reach the end-of-first-grade benchmark while coursing second-grade. These numbers show the alarming reality that the education system is facing in a crucial learning stage for students. These results reflect a combination of a lagging deficit in early reading levels in Chile and the negative impact from the pandemic.

Additionally, and unlike other assessments that only measure reading comprehension abilities, this study allowed us to tap

into the reading subprocesses where students who struggle with comprehension also exhibit lower performance levels. Analyzing how these subprocesses operate helps us understand the underlying reasons for poor comprehension.

Results show that students with low comprehension are lacking in basic literacy skills that should have been acquired in the previous year, particularly word reading. It indicates that an important portion of second graders' reading deficits stem from skills that were not practiced in grades and so, if delays in these subprocesses are not addressed, it will be very hard for these students to meet the reading comprehension standards they must reach by the end of second grade.

In addition, results indicate that the socioeconomic level of students' schools seems to be a strong determinant of students' reading abilities. This calls for urgent prioritization of underperforming schools, which are serving larger high-poverty populations. However, it is not possible to assume that all schools in the same socioeconomic group show similar performance. If it were possible to identify those schools achieving adequate reading comprehension levels, knowledge and experience could be gathered to strengthen the education system and enhance collaboration among schools. This would enable the adaptation and replication of pedagogical routines, support, and information management for the sustained improvement of teaching and learning processes related to reading skills.

Unfortunately, the sample measurement method used in this study does not allow for the identification of schools achieving adequate levels that could serve as a learning reference for other institutions. Therefore, it is essential to apply additional census efforts or similar approaches at the national level, enabling the Ministry of Education to identify benchmarks regarding reading instruction and best improvement practices. It is crucial to ensure that all schools are using some internal strategy to monitor progress in reading performance, identifying baseline scores, priorities, and yearly progress both collectively and for each student. Finally, it is important to underscore the relevance of implementing tools that allow visualization of students' achievement levels not only in reading

comprehension but also in each of the reading subprocesses. This is essential for the identification of improvement areas and the design of policies and best practices that tackle the underlying obstacles to effective reading comprehension. Given that governments have limited resources, it is crucial to maximize the impact of interventions aimed at improving reading outcomes. Addressing and prioritizing the specific difficulties that students face (for example, focusing on word reading rather than listening comprehension) would provide an opportunity to do this.

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APPENDIX

Appendix A: Criteria Information in DIALECT

Table A1
Criteria for interpreting results at the end of second grade.

Level	Reading comprehension	Listening comprehension	Vocabulary meaning	Print knowledge	Word reading
Advanced	> 510L	N/A	> 48 points	N/A	> 8 points
Satisfactory	[326L - 510L]	> 4 points	[44 - 48] points	>= 9.5 points	[6 - 8] points
Basic	[210L - 325L]	4 points	[37 - 43] points	N/A	[4 - 5] points
Deficient	< 210L	< 4 points	< 37 points	<= 9 points	< 4 points

Note: based on "Timely Diagnosis for Quality Learning", Universidad de los Andes de Chile.

Table A2
Expected level of reading comprehension at the end of each grade level.

Level (At the end of the year)	Deficient	Basic	Satisfactory	Advanced	Expected level per year
First-grade	BR	20L - 190L	215L - 405L	> 435L	210L - 410L
Second-grade	BR - 190L	215L - 310L	330L - 490L	> 520L	325L - 510L
Third-grade	BR - 190L	330L - 425L	460L - 590L	> 625L	445L - 605L
Fourth-grade	450L - 545L	570L - 630L	660L - 775L	> 825L	550L - 700L
Fifth-grade	< 619L	620L - 829L	839L - 1,010L	> 1,010L	620L - 829L
Sixth-grade	< 729L	730L - 924L	925L - 1,070L	> 1,070L	730L - 924L
Seventh-grade	< 769L	770L - 969L	970L - 1,120L	> 1,120L	770L - 969L
Eighth-grade	< 789L	790L - 1,009L	1,010L - 1,185L	> 1,185L	790L - 1,009L
Ninth-grade	< 849L	850L - 1,049L	1,050L - 1,260L	> 1,260L	850L - 1,049L
Tenth-grade	< 889L	890L - 1,079L	1,080L - 1,335L	> 1,335L	890L - 1,079L
Eleventh-grade	< 984L	985L - 1,184L	1,185L - 1,385L	> 1,385L	985L - 1,184L
Twelfth-grade	< 984L	985L - 1,184L	1,185L - 1,385L	> 1,385L	985L - 1,184L

Note: based on "Timely Diagnosis for Quality Learning", Universidad de los Andes de Chile.

Table A3
Criteria for interpreting results at the end of first grade.

	Deficient	Basic	Satisfactory	Advanced
Reading comprehension	< 100L	[100L - 210L]	[211L - 410L]	> 410L
Listening comprehension	< 2 points	[2 - 3] points	4 points	> 4 points
Vocabulary meaning	< 27 points	[27 - 36] points	[37 - 42] points	> 42 points
Alphabet knowledge	< 20 points	[20 - 25] points	< 25 points	N/A
Word reading	< 4 points	[4 - 5] points	[6 - 8] points	> 8 points

Note: based on "Timely Diagnosis for Quality Learning", Universidad de los Andes de Chile.

Table A4
Overview of assessment sections.

Reading comp.	Students start reading short texts of increasing complexity. Each student answers questions about a text and advances until accumulating 5 errors. Upon the fifth error, the application assesses whether the score accumulated is below the grade-level cut-off point. If the score is below the test continues, otherwise, it is interrupted here.
Listening comp.	Students hear a brief narrative/informational text (second-grade level). Then they are asked 2 literal comprehension questions (locating/recalling information), two inferential level questions (relating what they heard to prior knowledge), and one vocabulary-in-context question.
Vocabulary meaning	Students are asked to identify the meaning of a word, choosing one of four pictures on the screen. Both keywords and distractors are from a linguistic corpus of words found in the school texts across subjects and grade levels in the Chilean curriculum (see Pezoa & Orellana, 2021; Orellana & Pezoa, 2021).
Print knowledge	Students are asked to identify basic elements of any printed text, such as title, author, illustrator, and punctuation marks.
Word reading	Students hear high-frequency words and must recognize its written form from among three options that share some similar characteristics (10 items).

Appendix B: Participation of schools

Schools were randomly selected by "*Por un Chile que Lee*" network, with prior stratification based on administrative dependence. 68

schools were invited, of which 39 agreed to participate (success rate of 57.4%): 5 Public Local Education Services (SLEP), 16 municipal schools, 8 subsidized private schools (PS), and 10 private schools (PP). 3

Specifically, 21 municipal schools were contacted, and 16 agreed to participate; 6 SLEP were contacted, and 5 agreed to participate; 14 PS were contacted, and 8 agreed to participate, and 27 PP were contacted, of which 10 agreed to participate. Table B1 shows the success rate for different administrative dependencies in the contact process. The highest success rate is in the SLEPs and the lowest in the private paid schools.

Table B1
Substitution of educational institutions

Type of school	Participating schools	Invited Schools	Success rate with replacement
Municipal	16	21	76%
SLEP	5	6	83%
PS	8	14	57%
PP	10	27	37%

Table B2
Sampling error

	Sample size	Population size	Error with 95% confidence
Public schools	625	23,153	±3,9%
PS	268	55,434	±6%
PP	260	15,170	±6,4%

Appendix C: Sampling

The test was administered to a second-grade class in each school. However, there are two exceptions where the test was applied to two classes in the same school.

The attendance during the test administration periods was not complete, therefore not all students took the test. The test was conducted on two dates at each school (between May 15 and June 20).

In total, 1,172 students took the test, equivalent to 89% of the enrollment of 1,318 students. Figure C1 shows the distribution of the proportion of students who took the assessment out of the total class in each type of school. Most students belong to schools with coverage between 80% and 100% of students. Figure C2 details the coverage of each school ordered from highest to lowest. The coverage was 90% in SLEPs, 83% in municipal schools, 95% in subsidized private schools (PS), and 91% in private paid schools (PP).

Figure C1
Test coverage by type of school

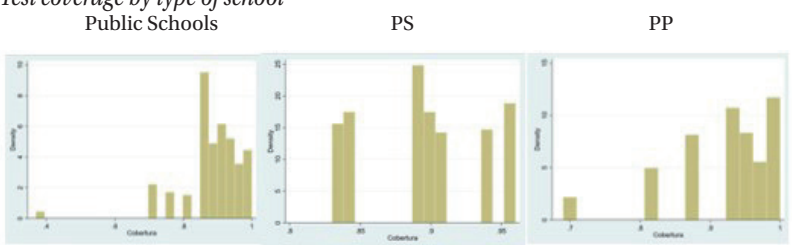
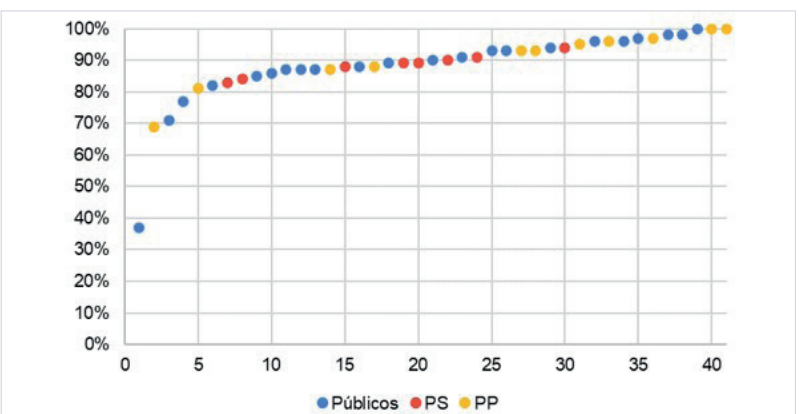


Figure C2
Coverage of each educational establishment, by type of school



We considered only students who took the test and whose guardians did not oppose the use of the information collected from it. Therefore, 19 students whose guardians opposed to the use of information were excluded from the sample (table C3).

In total, 1,153 students met the necessary conditions to be considered in the analysis, representing 87% of the total enrollment of second-grade students at these schools. This means that out of the initial 1,318 students, 165 students were not included in the analysis, because they did not take the test (146 students) or their guardian prohibited the use of their data (19 students).

Table C3
Students without consent to participate in the study by type of school

	N° students
Municipal	9
SLEP	4
PS	2
PP	4
Total	19

Appendix D: Sample adjustment

The observations were weighted to obtain a regionally representative sample, applying expansion factors and weights as appropriate. To do this, expansion factors were first calculated for each school based on the inverse probability of being selected in the sample. Then, a proportional adjustment was made to correct for absent students on the day of the test. Finally, a proportional adjustment is applied to the data based on the socioeconomic level of the students' educational establishments, according to the classification made by the *Agencia de la Calidad* in the 2022 SIMCE (GSE).

Table D1
Adjustment of schools in the sample for probability of selection, absences, and socioeconomic level

Municipal	Expansion factor	Expansion factor corrected for absences	Final expansion factor corrected for GSE
School-1	26	62	37
School-2	25	29	61
School-3	116	68	68
School-4	23	35	35
School-5	20	27	56
School-6	34	65	65
School-7	30	33	33
School-8	41	28	28
School-9	24	30	15
School-10	30	91	191
School-11	34	27	27
School-12	31	28	59
School-13	28	53	26
School-14	31	62	31
School-15	35	70	35
School-16	11	27	16
SLEP	Expansion factor	Expansion factor corrected for absences	Final expansion factor corrected for GSE
School-17	11	46	46
School-18	8	12	12
School-19	8	22	47
School-20	12	13	13
School-21	9	13	13
PS	Expansion factor	Expansion factor corrected for absences	Final expansion factor corrected for GSE
School-22	15	198	119
School-23	20	97	58
School-24	26	333	200
School-25	16	420	420
School-26	16	192	115
School-27	20	103	216
School-28	19	202	101
School-29	18	110	231
PP	Expansion factor	Expansion factor corrected for absences	Final expansion factor corrected for GSE
School-30	11	48	53

School-31	27	53	59
School-32	25	132	145
School-33	24	84	92
School-34	41	28	31
School-35	33	26	28
School-36	24	28	31
School-37	22	76	84
School-38	56	36	21
School-39	22	53	59

Note: The original sample contains 1,153 observations; 484 municipal establishments; 141 SLEPs; 268 subsidized private schools, and 260 private paid schools.

Table D2
Calibration by socioeconomic level

Income level	Urban RM	Sample with ef corrected for absenteeism	Weights	Sample adjusted for SES
Low	6%	13%	0.5	7%
Mid-low	25%	25%	1	26%
Mid	33%	16%	2.1	31%
Mid-high	19%	30%	0.6	19%
High	17%	16%	1.1	18%

Table D3
Descriptive statistics by type of school

Public schools (Municipal + SLEP)	Urban RM	Adjusted sample	Difference
Low	17%	11%	6%
Mid-low	40%	30%	10%
Mid	33%	54%	-21%
Mid-high	10%	5%	5%
High	0%	0%	0%
Prop. of open days during pandemic	32%	28%	-4%***
Prop. of females	46%	54%	-7%*
Size of school	674	614	60
Size of second grade cohort	64	63	1
Reading SIMCE score	257	259	-2
School with preschool and secondary school	13%	4%	8%**
School with preschool and primary school	84%	96%	11%**

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

PS	Urban RM	Adjusted sample	Difference
Low	3%	7%	-4%
Mid-low	26%	32%	7%
Mid	42%	30%	11%
Mid-high	28%	32%	4%
High	2%	0%	2%***
Prop. of open days during pandemic	48%	51%	3%
Prop. of females	49%	51%	2%
Size of school	1,073	1,204	131
Size of second grade cohort	87	94	7
Reading SIMCE score	267	257	10
School with preschool and secondary school	16%	52%	34%*
School with preschool and primary school	77%	39%	37%**

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Differences in the high socioeconomic level are significant because the sample lacks observations of students from subsidized schools with high socioeconomic level.

PP	Urban RM	Adjusted sample	Difference
Low	0%	0%	0%
Mid-low	0%	0%	0%
Mid	0%	0%	0%
Mid-high	1%	1%	0%
High	99%	99%	0%
Prop. of open days during pandemic	65%	69%	3%
Prop. of females	50%	63%	13%
Size of school	1,116	1,206	89
Size of second grade cohort	90	89	1
Reading SIMCE score	301	304	3
School with preschool and secondary school	0%	0%	0
School with preschool and primary school	88%	100%	12%***

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix E: Detailed distribution of disaggregated DIALECT results

Table E1
Distribution of disaggregated DIALECT results

Reading comprehension	Sample	Adjusted sample
Below 1° grade level	59%	60%
End of 1° grade level	13%	12%
End of 2° grade level	10%	9%
End of 3° grade level or above	18%	19%

Table E2
Distribution of disaggregated DIALECT results by type of school

	Public		PS		PP	
Reading comprehension	Sample	Adjusted sample	Sample	Adjusted sample	Sample	Adjusted sample
Below 1° grade level	72%	72%	56%	64%	30%	29%
End of 1° grade level	12%	14%	12%	10%	15%	16%
End of 2° grade level	6%	4%	12%	9%	18%	18%
End of 3° grade level or above	9%	10%	20%	17%	37%	37%

Table E3
Results by gender of students in the adjusted sample (%)

Reading comprehension	Males (%)	Females (%)
Below end of 1° grade	64	56
End of 1° grade	11	13
End of 2° grade or above	25	31
Listening comprehension	Males (%)	Females (%)
Below end of 1° grade	6	12
End of 1° grade	17	20
End of 2° grade or above	77	68
Vocabulary	Males (%)	Females (%)

Below end of 1° grade	41	40
End of 1° grade	13	8
End of 2° grade or above	46	52
Print knowledge	Males (%)	Females (%)
Deficient	64	61
Adequate	36	39
Word reading	Males (%)	Females (%)
Below end of 1° grade	64	61
End of 1° grade or above	36	38

Figure E4

Results by gender and type of school in the adjusted sample (%)