Chile

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Introduction

Overview of Education System

The Chilean education system is centralized and governed by the Ministry of Education, which is responsible for ensuring the right to education for all students. The mission of the Ministry of Education is to ensure an inclusive and quality education system that contributes to people's comprehensive education and permanent training from early childhood to higher education, through the formulation and implementation of policies, standards, and regulations.

The aims of the Ministry of Education are

- to finance a free system at all levels,
- to guarantee free access to education at all levels, and
- to promote the development of a unified system for education policy for both public and private institutions.

The main functions of the Ministry of Education are to

- propose and implement education policy (define regulations and national education programs),
- define a national curriculum and education standards (for learning, teachers, and schools),
- supply textbooks and educational resources (study plans and teaching guides) for all public and private subsidized schools,
- approve the national strategy for the development of public education, and
- provide pedagogical support and technical assistance to schools and/or their administrators.

Chile has four levels of education (early childhood/preschool, primary, secondary, and postsecondary) and education modalities aimed at serving specific populations (special education students, youth, and adults).

Chile's school system is organized as follows:

- Early childhood/preschool (International Standard Classification of Education [ISCED] Level 0) is for children ages 0 to 5. Only 1 year of preprimary education (kindergarten) is compulsory as of 2015.

- Basic education comprises primary and lower secondary education.
  - Primary education (ISCED Level 1) comprises Grades 1 to 4 and is for children ages 6 to 10.
  - Lower secondary education (ISCED Level 2) comprises Grades 5 to 8.
- Upper secondary education (ISCED Level 3) comprises Grades 9 to 12.

Schooling begins at age 6 and has 13 years of compulsory education (including 1 year of kindergarten in addition to Grades 1 to 12) (Law 19.876).[1]

There are approximately 12,000 educational institutions in Chile (schools and preschools).[a] Schools may offer basic education, upper secondary education (high school), or both (complete education).

Depending on their administrative status, schools are classified as follows:

- public—funded by the state and managed by local governments (municipalities) or local education services (766,000 children)[b]
- private subsidized schools—funded by the state and managed by private entities (1,071,000 children)
- private paid schools—financed by families and managed by private entities (200,500 children)

The system's coverage for mandatory levels is very high. The total enrollment in primary education is 2,037,500 girls and boys, which is almost universal (99.4%) for children between 6 and 11 years old.

The Quality Assurance System,[2] which has operated since 2011 to guarantee quality education for all students, is composed of the Ministry of Education, the Superintendence of Education, the National Council of Education, and the Education Quality Agency. The Superintendence of Education monitors the implementation of education regulations and school expenditures and imposes sanctions. The National Council of Education approves the national curriculum, standards of learning, and national and international assessment plans, among other education frameworks. The Education Quality Agency evaluates student learning outcomes and other indicators of personal and social development. It also evaluates and provides guidance to schools on school management issues and other institutional and pedagogical processes.

The Ministry of Education is responsible for developing the national curriculum, which determines the fundamental objectives and minimum content for each grade and subject in all schools. In primary and lower secondary education (basic education), there is one common curriculum for mathematics and science. All students at this level follow the same track. In upper secondary education, there is one common curriculum for Grades 9 and 10, but there are different curricula for Grades 11 and 12, depending on whether students follow the academic or the vocational track. Schools are free to decide how to implement the curriculum and may

a See https://datosabiertos.mineduc.cl/ for more information about the statistics cited throughout this section.

b Law 21.040, enacted in 2017, establishes the new System of Public Education, gradually transferring administration of schools from municipal to local education services. Seventy local education services will be developed by 2028.

include additional educational objectives, content, and programs with prior approval from the Ministry of Education.

The main changes to education policy over the last decade are as follows:

- In 2015, a law banned profit in education, phasing out the copayments of families. It also ended the selection of students in admissions processes by both public and private subsidized schools.
- In 2016, a law increased requirements to study pedagogy, increased demands on university pedagogy programs, increased remuneration, established mentoring at the beginning of professional practice, and advocated for better working conditions (more nonteaching hours) and career development for teachers associated with performance assessment results.
- In 2017, a law established the new System of Public Education. This new regulation transfers schools from municipal administration to local education services (which centralize management and education services in the territory). This system will implement up to 70 local education services across the country by 2028.
- Between 2020 and the first quarter of 2022, Chilean schools closed for more than 250 days, corresponding to almost 52 weeks, or 1.4 academic years.[3] Among the actions taken by the Ministry of Education to facilitate distance education was the reduction of the national curriculum to a subset of prioritized learning objectives.

Use and Impact of TIMSS

Chile's participation in TIMSS 1999, 2003, 2011, 2015, and 2019 has helped not only to assess the learning of Chilean students in mathematics and science in comparison with international standards, but also to monitor the Chilean education system by measuring changes in student learning over time. Since 1999, TIMSS results have shown an improvement in mathematics at eighth grade. Policymakers in Chile took note of the national average score for eighth-grade science from 2003 to 2011. These results led to the evaluation of education policies in the country against suggested policy guidelines.

TIMSS data have shown socioeconomic and gender gaps that affect the Chilean education system. Chile has shown a constant outcomes gap between boys and girls, such that boys achieve significantly better mathematics results than girls. Another gap is revealed among different types of schools (i.e., public sector schools, populated mostly by students from lower socioeconomic groups, exhibit lower achievement than private paid schools). The same gap is present in eighth-grade science results according to both socioeconomic status and gender indicators.

Chile's participation in TIMSS also has provided a stimulus and a point of reference for making improvements to the national curriculum. It has provided information contributing to a better understanding of school organization, teacher education, and teaching practices in a comparative context. The curricular basis of the Chilean education system has undergone

several updates since 2000, informed by assessment frameworks of international studies such as TIMSS.

Despite important reforms to the national curriculum made in 2000, TIMSS 2003 showed continuing gaps between the TIMSS framework and the Chilean curriculum, especially in algebra and geometry and in physics and environmental science. As a result, the Chilean curriculum was updated again in 2009, taking into account the curriculum framework provided by TIMSS 2003. Subsequently, the frameworks of TIMSS 2011—in particular, fourth-grade science (2012), eighth-grade science (2013), and eighth-grade mathematics (2013) informed several content updates to the Chilean mathematics and science curricula.

Participation in TIMSS has also affected Chile's national standardized testing system (Simce), because TIMSS constitutes a benchmark for assessment methodologies, evaluation frameworks, designing and coding of open-ended questions, and results reporting, among other components of the Chilean assessment system. Furthermore, TIMSS results serve as a validity reference for national census tests.

The Mathematics Curriculum in Primary and Lower Secondary Grades

The current mathematics curriculum for fourth grade was implemented in 2012, and the curriculum for eighth grade was approved in 2013 and implemented in 2016. In 2020, in the context of the COVID-19 pandemic, Chile selected a subset of learning objectives (*Priorizacion curricular*, or narrowed curriculum) for teachers to focus on. This means that as of 2024, Chile has two intended curricula: a broad current curriculum for each subject and a more limited curriculum that is most likely the curriculum that is implemented.

This reduction of the intended curriculum began in 2020 and was then revised, updated, and re-edited in March 2023; it will be valid until 2025 when a new full curriculum for Grades 1 to 10 will be approved.[4] Chile administered TIMSS 2023 in November 2023, so the curriculum that is measured is the narrowed one. Exhibits 1 and 2 present the content areas and learning objectives of the narrowed mathematics curriculum for Grades 4 and 8, respectively.

Exhibit 1: Mathematics Curriculum, Grade 4

Content Area	Learning Objectives
Numbers and Operations	• represent and describe numbers from 0 to 10,000 o counting them 10 by 10, 100 by 100, and 1,000 by 1,000 o reading and writing them o representing them in concrete, pictorial, and symbolic ways o comparing and ordering them on a number line or positional table o identifying the place value of digits up to 10,000 o composing and decomposing numbers up to 10,000 in additive form, according to their positional value

Exhibit 1: Mathematics Curriculum, Grade 4 (Continued)

Content Area	Learning Objectives
Numbers and Operations	• describe and apply mental calculation strategies o forward and backward counting o double and divide by 2 o by decomposition o use double of double • demonstrate understanding of addition and subtraction of numbers up to 1,000 o using personal strategies to perform these operations o decomposing the numbers involved o estimating sums and differences o solving routine and nonroutine problems involving addition and subtraction o applying the algorithms in the addition of up to four addends and in the subtraction of up to one subtrahend • demonstrate understanding of the multiplication of three-digit numbers by one-digit numbers o using strategies with or without concrete material o using multiplication tables o estimating products o using the distributive property of multiplication with respect to addition o applying the multiplication algorithm o solving routine problems • demonstrate understanding of division with double-digit dividends and single-digit divisors o using strategies to divide with or without concrete material o using the relationship between division and multiplication o estimating the quotient applying the dividend decomposition strategy o applying the division algorithm • solve routine and nonroutine problems in everyday contexts that involve money by selecting and using the proper operations • demonstrate understanding of fractions with denominators 100, 12, 10, 8, 6, 5, 4, 3, and 2 o explaining that a fraction represents part of a whole or a group of elements and a place on a number line o describing situations in which fractions can be used o showing that a fraction can have different representations o buying and ordering fractions (for example, 1/100, 1/8, 1/5, 1/4, 1/2) with concrete and pictorial material • add and subtract fractions with the same denominator (100, 12, 10, 8, 6, 5, 4, 3, and 2) in concrete and pictorial ways in a problem-solving context

Exhibit 1: Mathematics Curriculum, Grade 4 (Continued)

Content Area	Learning Objectives
Algebra and Patterns	• identify and describe number patterns in tables that involve an operation, manually and/or using educational software • solve one-step equations and inequalities for values from 0 to 100 in one step, using addition and subtraction, checking the results in a pictorial and symbolic manner, and applying the inverse operation (addition or subtraction)
Geometry	• demonstrate understanding of line of symmetry o identifying 2D symmetrical figures o creating 2D symmetrical figures o drawing one or more lines of symmetry in 2D figures o using geometric software • move, rotate, and mirror two-dimensional figures • construct angles using a protractor and compare them
Measuring	• measure length in standardized units (m, cm) and convert between units (e.g., from m to cm and vice versa) in the context of problem-solving • demonstrate understanding of the concept of area of rectangles and squares o recognizing that the area of a surface is measured in square units o selecting and justifying the choice of a standardized unit (cm^2 and m^2) o determining and recording the area in cm^2 and m^2 in nearby contexts o constructing different rectangles for a given area (cm^2 and m^2) to show that different rectangles can have the same area o using geometric software • demonstrate understanding of the concept of volume o • selecting a nonstandardized unit to measure the volume of a body o • recognizing that volume is measured in cubic units o • measuring and recording volume in cubic units o • using geometric software
Data and Probabilities	• conduct surveys, analyze the data, and compare with the results of random tests, using charts and graphs • read and interpret pictographs and simple bar graphs with scale and report findings

Exhibit 2: Mathematics Curriculum, Grade 8[5]

Content Area	Learning Objectives
Numbers	• demonstrate understanding of multiplication and division of integers o represent them in concrete, pictorial, and symbolic ways o apply procedures used in multiplication and division of natural numbers o apply the rule of order of operations o solve routine and nonroutine problems • use multiplication and division of rational numbers in the context of problem-solving o •epresent them on a number line o use different number sets (fractions, decimals, and integers) • explain multiplication, division, and the process of forming powers of numbers with natural number bases and exponents up to 3 in concrete, pictorial, and symbolic ways • demonstrate understanding of the square roots of natural numbers o estimate them intuitively o represent them in concrete, pictorial, and symbolic ways o apply them in geometrical situations and in daily life
Algebra and Functions	• model situations in everyday life and in other academic subjects, using linear equations of the form $ax = b$; $\frac{x}{a} = b$, $a \neq 0$; $ax + b = c$; $\frac{x}{a} + b = c$, $a \neq 0$; $x = b + cx$; $a(x + b) = c$; $ax + b = cx + d(a, b, c, d, e)$ • demonstrate understanding of affine functions o generalize as the sum of a constant with a linear function • move linear functions in the Cartesian plane o determine the constant change from one interval to another, graphically and symbolically, manually, and/or by using educational software o link them to simple interest o use them to solve everyday life problems and in other academic subjects
Geometry	• explain, in a concrete, pictorial, and symbolic way, the validity of the Pythagorean theorem and apply it to the resolution of geometric problems and everyday life, manually and/or with educational software • describe the position and movement (translations, rotations, and reflections) of 2D figures, manually and/or with educational software, using o the vectors for the translation o the axes of the Cartesian plane as reflection axes o the points of the plane for rotations

Exhibit 2: Mathematics Curriculum, Grade 8 (Continued)

Content Area	Learning Objectives

Probabilities and Statistics	• show understanding of the measures of position, percentiles, and quartiles
	  ○ identifying the population that is above or below the percentile
	  ○ representing them with diagrams, including the box diagram, manually and/or with educational software
	  ○ using them to compare populations
	• evaluate the way data are presented
	  ○ comparing information of the same data represented in different types of graphs to determine strengths and weaknesses of each one
	  ○ justifying the choice of graph for a given situation and its corresponding dataset
	  ○ detecting manipulations of graphs to represent data
	• explain the multiplicative combinatorial principle
	  ○ based on specific situations
	  ○ representing it with regular tables and trees, manually and/or with educational software
	  ○ using it to calculate the probability of a composite event

The Science Curriculum in Primary and Lower Secondary Grades

The science curriculum for fourth grade was updated in 2012, and the science curriculum for eighth grade was approved in 2013 and implemented in 2016.[6] It combines scientific disciplines, such as biology, chemistry, physics, botany, geology, and astronomy. These disciplines address a wide variety of natural phenomena (e.g., living beings, matter, energy and its transformations, the solar system, and Earth). As for mathematics, the science curriculum was narrowed in 2020 to facilitate teaching during the COVID-19 pandemic. The last actualization was in 2023, and it will be valid until 2025, when a new full curriculum for Grades 1 to 10 will be approved.[7]

Exhibits 3 and 4 present the content areas and fundamental objectives of the narrowed science curricula for Grades 4 and 8, respectively.

Exhibit 3: Science Curriculum, Grade 4

Content Area	Fundamental Objectives
Life Science	• recognize through exploration that an ecosystem is composed of living elements (e.g., animals, plants) and nonliving elements (e.g., rocks, water, land) that interact with each other • observe and compare adaptations of plants and animals for survival in ecosystems in relation to their structure and behavior (e.g., body cover, camouflage, type of leaves, hibernation) • give examples of food chains, identifying the roles of producers, consumers, and decomposers in ecosystems in Chile

Exhibit 3: Science Curriculum, Grade 4 (Continued)

Content Area	Fundamental Objectives
Life Science	• human body and health o explain, with the help of models, body movements, considering the coordinated action of muscles, bones, tendons, and joints (e.g., arms and legs), and describe the benefits of physical activity for the musculoskeletal system o identify structures of the nervous system and describe some of its features, such as transmitting information (spinal cord and nerves) and processing and control (brain)
Physics andChemistry	• demonstrate, through experimental research, that matter has mass and occupies space, using materials from the environment • compare the three states of matter (solid, liquid, and gas) in relation to properties such as the ability to flow and change shape and volume, for example • demonstrate, through experimental research, the effects of the application of forces on objects, considering changes in shape, speed, and direction of movement, for example
Earth Science and the Universe	• describe, using models, Earth's layered structure (crust, mantle, and core) with distinctive characteristics in terms of composition, hardness, and temperature • explain changes to the surface of Earth caused by the interaction of its layers and movement of tectonic plates (e.g., earthquakes, tsunamis, volcanic eruptions)

Exhibit 4: Science Curriculum, Grade 8

Content Area	Fundamental Objectives
Biology	• develop models to explain the relationship between the function of a cell and its parts, considering the following: o structures (nucleus, cytoplasm, cell membrane, cell wall, vacuoles, mitochondria, chloroplasts, etc.) o eukaryotic cells (animal and plant) and prokaryotic cells; cell types (e.g., intestinal, muscular, nervous, pancreatic) • create models to show that plants have specialized structures to respond to environmental stimuli, similar to the human body, considering substance transport processes and gas exchange • explain, based on evidence, the interaction of human body systems, organized by specialized structures that contribute to its balance, considering the following: o the digestion of food through the action of digestive enzymes and its absorption into the bloodstream o the role of the circulatory system in transporting nutrients, gases, metabolic waste, antibodies, and other substances o the process of pulmonary ventilation and gas exchange at the alveolar level

Exhibit 4: Science Curriculum, Grade 8 (Continued)

Content Area	Fundamental Objectives
Biology	◦ the role of the excretory system in the filtration of blood, regulating body water, and waste disposal ◦ the prevention of diseases that are caused by excessive consumption of substances such as tobacco, alcohol, fat, and sodium • analyze and evaluate, based on evidence, factors contributing to physical health, proposing a plan that considers the following: ◦ a balanced diet ◦ regular physical exercise ◦ avoiding alcohol, tobacco, and drugs
Physics	• analyze a home electrical circuit and compare circuits in series and in parallel through experimentation, in relation to the following: ◦ electric energy ◦ potential difference ◦ amperage ◦ electrical power ◦ electrical resistance ◦ energy efficiency • develop models and experimental research to show that heat is a process of transfer of thermal energy between two or more bodies that are at different temperatures, or between a heat source and an object, considering the following: ◦ methods of heat transfer (conduction, convection, and radiation) ◦ the effects of heat transfer (e.g., change in temperature, deformation, change of state) ◦ the amount of heat transferred and absorbed in a thermal process ◦ technological objects that protect high or low temperatures of living beings and objects ◦ temperature difference (at the level of particles) ◦ temperature measurements using thermometers and various scales (e.g., Celsius, Kelvin, Fahrenheit)
Chemistry	• investigate and analyze how knowledge about the field of chemistry has evolved, considering the contributions and evidence of the following: ◦ Dalton's atomic theory ◦ atomic models developed by Thomson, Rutherford, and Bohr, among others • use the periodic table to investigate the properties of chemical elements based on patterns, considering the following: ◦ atomic number ◦ atomic mass ◦ electrical conductivity ◦ thermal conductivity ◦ brightness ◦ bonds that can be formed

Teacher Professional Development Requirements and Programs

In Grades 1 to 4, teachers usually are general teachers; in Grades 5 to 8, they generally are specialized in a subject. Since 2010, Chile has sought to strengthen and dignify the teaching profession, support its performance in the classroom, and promote its public appreciation. In 2016, Teacher Professional Development Law 20.903 increased requirements to study pedagogy, increased demands on university pedagogy programs, established a test before ending the undergraduate program, and promoted mentoring for new teachers at the beginning of professional practice.[8]

Ongoing Professional Development Programs

The Center for Development, Experimentation and Pedagogical Research (CPEIP),[c] within the Ministry of Education, is in charge of designing, implementing, and evaluating professional development policies for teachers in order to improve the quality of education.

Law 20.903 expanded the performance evaluation system for teachers and established career development for teachers associated with performance assessment. Nevertheless, since 1996, a mandatory evaluation system has evaluated teachers in both public and subsidized schools. Teachers have to take a written test of disciplinary and pedagogical knowledge specific to their subject and grade level and submit a portfolio with evidence of professional performance (including written and audiovisual material for assessment). As of 2016, evaluation has been required to advance in the teaching career. Teachers who obtain good results on the assessment and advance in their career receive an additional yearly allowance.

Professional development programs intend to improve teachers' performance and advance their teaching career. Assessment results are shared with teachers, school principals, management teams, and school administrators. Schools have as one of their tasks the development of professional skills of their teaching teams, ensuring quality service training. Local training for professional development is one of the key processes that schools implement; it aims to promote collaborative work and pedagogical feedback. It is a process through which teachers, as a team and individually, prepare work in the classroom, systematically reflect on their own teaching and learning practices, and evaluate and provide feedback to improve those practices. It is up to the principal of the school to implement the process through local training plans for professional development, evidently linked to the assessment's results.

In addition, teachers have the opportunity to participate in courses and training in areas where results are not as good as expected. CPEIP collaborates in the professional development of teachers by offering free training programs, courses, workshops, or activities, directly or through the collaboration of accredited universities or certified institutions, as well as granting scholarships for them. Finally, Law 20.903 increased remuneration for teachers in public and private subsidized schools and established better working conditions by giving them more nonteaching hours.

c See www.cpeip.cl for more information.

Monitoring Student Progress in Mathematics and Science

The Education Quality Agency is responsible for the continual and periodic assessment of the education system to improve the quality of education. They assess, on an annual basis, student learning outcomes and the performance of schools through the national assessment census system (Simce), based on national curriculum standards.

The tests measure the current broad curriculum in every school, i.e., the complete one, not the narrowed one in effect since 2020. The assessment in mathematics and language in Grades 4, 8, and 10 should take place every year,[d] whereas assessments in the social and natural sciences (and tests in other grades) vary year to year, depending on the annual evaluation plan.

Simce assessment includes questionnaires for students, parents, teachers, and principals designed to measure a set of indexes that reflect the personal and social development of students and complement the results of tests. Simce standardized academic tests for students are paper tests.

Results in scores and achievement levels (what students are able to do) are open to the public and published at school, regional, and national levels. The individual results of students are protected, confidential, and not published.

Special Initiatives in Mathematics and Science Education

In recent years, the Ministry of Education has developed educational programs that aim to provide instructional support and resource materials in every subject area, including science and mathematics. The most prominent program in recent years has been the Schools Up Plan, implemented in more than 400 schools across the country since 2019. The Schools Up Plan aims to support schools categorized as "insufficient" by Simce. The aim of the program is to improve student learning through the leveling of learning, the prevention of school absenteeism, and the accompaniment of management teams. Leveling of learning strategies incorporate the provision of educational resources in mathematics and language, pedagogical support, and demonstration classes, as well as other actions.

Explora is a national program created in 1995 by the National Commission for Scientific and Technological Research to provide nonformal education in science and technology. The program focuses on children and young students and fosters a scientific culture for citizenship exercise. Explora offers a wide variety of activities and initiatives to promote science, technology, and innovation for kindergartens, students, teachers, administrators, and all those who are part of a school community. These include guidance of scholarly research, national contests, regional congresses, national school conventions on science and technology, science camps, and activity books.

Since 2022, the Ministry of Education has promoted a comprehensive and strategic response for the recovery of the education system after the effects of the prolonged closure of schools due

d In recent years, some tests have been suspended due to the COVID-19 pandemic.

to the COVID-19 pandemic. This Educational Reactivation Plan covers three dimensions: school climate and mental health; strengthening learning; and attendance and re-engagement. The second dimension focuses on language (reading, writing, and communicating), mathematics, digital transformation, innovation, and comprehensive education, including science, arts, and sports. Two programs stand out within this dimension: MatCon and ICEC.

The Education Laboratory of the Mathematical Modeling Center of the University of Chile implements MatCon. It seeks to provide interactive and innovative educational resources that allow teachers to manage mathematics teaching that addresses the motivations and concerns of children and young people, helping them make sense of relevant problems and get involved in their solutions. MatCon resources are for students in Grades 7 to 12.

The Scientific Inquiry Program for Science Education (ICEC) is a national initiative of the Ministry of Education aimed at improving the teaching and learning of science in schools and high schools, urban and rural, through the promotion of the use of scientific inquiry as a pedagogical didactic approach to teaching science. ICEC addresses three levels of education: nursery education, basic education, and up to the second year of secondary education. It carries out various actions that promote pedagogical innovation in science through professional development activities for special education professionals, preschool educators, and basic and secondary education teachers throughout the country.

Finally, the Ministry of Education has recently reached an agreement with several universities to offer special vacancies to encourage women to pursue careers in mathematics, science, and technology. Universities will be able to offer spots for women interested in studying science, technology, engineering, and mathematics (STEM) careers starting with the 2024 admission process. Women will be able to apply to these universities and access STEM careers with fewer requirements.

Suggested Reading

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