Belgium (French)

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Introduction

Overview of Education System

In 1989, the Education Department was transferred from the federal government to the French, Flemish, and German communities, which are defined on a linguistic and cultural basis. Federal authorities are responsible for deciding the extent of compulsory education, minimum requirements for issuing a diploma, and teachers' pensions, while the determination of the curricula, skills, and levels of achievement for primary, secondary, and higher education lies with the communities. Education is organized by the Wallonia-Brussels Federation (FWB) or subsidized by it through grant-aided public education and denominational or nondenominational grant-aided independent education. Provided they comply with laws, decrees, and orders, controlling authorities have fairly extensive autonomy, particularly with regard to methods of education and assessment.

Compulsory education starts at age 5 (since 2020) and ends at age 18. From ages 15 to 18, students can attend school part time. Preprimary education is well developed and free of charge. Children can enter preschool at age 2.5. The vast majority of children regularly attend preschool.

Primary education (Grades 1 to 6) and secondary education (Grades 7 to 12) each last for 6 years. Continuing the work of primary education, the first stage of secondary education (Grades 7 and 8) aims to build and develop common basic knowledge and skills among all students. Since academic year 2020–2021, a common core curriculum has been implemented gradually from preprimary education (pre-K) to the end of the third year of secondary education (Grade 9) in FWB. Since academic year 2020–2021, the 3 years of preprimary education have been organized according to this principle of a common core curriculum. Since the 2022–2023 academic year, the first 2 years of primary education (Grades 1 and 2) have followed the same organization. The implementation of this common core curriculum (in academic year 2023–2024 for Grades 3 and 4) should be finalized up to the third year of secondary education (Grade 9) in academic year 2028–2029. Until 2027–2028, from the third year of secondary education onward (Grades 9 to 12), a distinction is made between two main education streams: secondary "transition" education (general, technical, or arts) leading to higher education, and secondary "qualification" education (technical or arts and vocational) leading mainly to the labor market.

After graduating from the qualification stream, students who complete an extra year of study become qualified to enter higher education. Part-time education is organized in centers for dual education and training (*Centres d'éducation et de formation en alternance*, CEFA).

At the end of the 1990s, two major decrees for education were promulgated. The first, *décret Missions* (Missions Decree), defines four main objectives for the education system of FWB and the means to reach those objectives.[1] With an emphasis on the development of the individual and issues of equity, the decree strives "to get all students to acquire knowledge and skills which will enable them to engage in lifelong learning and to participate actively [in] the economic, social and cultural life" and "to guarantee to all students equal opportunities of social emancipation." The decree also introduces the important curriculum reform of Core Skills (*les Socles de Compétences*), which has been drawn up for Grades 2, 6, and 8. New programs congruent with those competencies have been introduced gradually following approval by the appropriate commissions.

The second decree, *décret École de la réussite* (Decree for a Successful School), is aimed at organizing primary education in two cycles: Cycle 1 spans the last grade of preschool to Grade 2, and Cycle 2 spans Grades 3 to 6.[2] The decree holds that grade repetition should be avoided within cycles; accordingly, this objective was set for Cycle 1 in 2000 and for Cycle 2 in 2005.

In addition to these reforms, FWB has regulated the enrollment of students in the first stage of secondary education by a 2011 decree. Furthermore, the Declaration on Community Policy states that the future of Wallonia and Brussels depends on the quality of education.[3] The 2015 Pact for Excellence in Education aims to meet the challenge of maintaining high education standards by making the best use of public resources and providing each social catchment area with adequate, complete, and complementary supply.

In 2019, the Parliament of FWB adopted the Code of Fundamental Education and Secondary Education (Books 1 and 2). This decree maintains the existing principles of the *décret Missions* that proved to be efficient but modifies what is less efficient by a gradual implementation of elements from the Pact for Excellence in Education. The Code (*Code – Livre Premier, Titre IV, Chapitre II, articles 1.4.2-1 et 1.4.2-2*) organizes the planning of new competence referentials: initial competence referential for pre-K education and competence referentials of the common core curriculum. The latter are more precise than the *Socles de compétences* since they establish on an annual basis the knowledge, skills, and competencies that students should acquire and develop in seven learning domains, among which are mathematics and science. As of 2022–2023, the Core Skills (*Socles de Compétences*) still established the skills that should be acquired by students in Grade 4 (fourth year of primary education). The new core curriculum for Grade 4 will come into force in the 2023–2024 academic year.

Use and Impact of TIMSS

TIMSS 2023 is the first time the French-speaking Community of Belgium has participated in TIMSS at Grade 4. In 1995, the French Community of Belgium participated in TIMSS at Grade 8. Given the new reforms (Pact for Excellence in Education) and specifically the common core curriculum, participation in future TIMSS cycles could be an important source of information about the effects of these reforms on teaching practices and student performance in mathematics and science in the French-speaking Community of Belgium.

The Mathematics Curriculum in Primary and Lower Secondary Grades

The French-speaking Community has a national curriculum that covers mathematics instruction from Grades 1 to 8. This curriculum, called Core Skills (*Socles de compétences*), defines the basis of mathematics instruction for every school; however, instructional methodology and classroom activities vary depending on the type of school. The Core Skills define the skills that must be mastered by the end of Grade 8. The curriculum document also defines the stages of schooling at which skills must be initiated (introduced), certified (fully mastered), or maintained: first stage (from the last year of kindergarten to the end of the second year of primary education), second stage (from the third to the sixth year of primary school), and third stage (the first 2 years of secondary school).

Teaching mathematics is not conceived as the transmission of knowledge but as an elaboration based on a variety of situations; indeed, from the earliest stages of basic education, students are encouraged to understand and act on their environment through activities that stimulate imagination, provoke thought, and develop critical-thinking skills. Problem-solving is considered the best way to promote mathematical thinking. The following four major transversal skill sets interact in problem-solving:

1. analyzing and understanding a message—These skills are focused on assessing the problem before dealing with mathematical strategies. It includes being able to take a situation as presented and transform it into a form amenable to mathematical treatment.
2. solving, reasoning, and arguing—These skills deal with solving the problem: applying mathematical reasoning while using mathematical concepts, procedures, facts, and tools to derive a mathematical solution.
3. applying and generalizing—These skills encourage stepping back from the situation in order to decide on what subjects and methods to use but also decide on taking new approaches.
4. structuring and synthesizing—These skills help to organize (orally or in writing) the process of reflection and allow integration of the new acquired knowledge.

Mathematical skills related to basic mathematical tools are also developed in four main mathematical content areas: numbers, solids and shapes, measures, and data handling.

Numbers

The Core Skills include competencies about knowledge about numbers and the operations on numbers. The knowledge about numbers is organized into two categories:

- counting, enumerating, and classifying—enumerating, reading, and writing numbers (whole numbers and decimal numbers) and classifying (situating, ordering, and comparing numbers)
- arranging numbers in families—deconstructing or reconstructing numbers (whole or decimal numbers) or creating families in numbers (for example, even numbers, odd numbers, multiples of, etc.).

The operations on numbers lead to developing skills in estimations; discovering and using operations (addition, subtraction, multiplication, and division) and their properties (when replacing a calculation by a simple one); and using mental calculation, written calculation, or a calculator depending on the calculation to perform. The construction of the addition and multiplication tables are also developed: Students understand their structure and reproduce them from memory. Algebra is introduced in the first year of secondary school, and in Grade 8, students have to master algebra skills (e.g., transforming algebraic expressions, solving equations or checking their solution, using in context the notations specific to algebra) and also make sense of algebraic expressions (e.g., constructing algebraic expressions where the letters are variables or unknown measures).

Solids and Shapes

This topic is focused on the following:

- location in space (situating oneself or objects or moving and following given directions, mastering the coordinate system [straight line and Cartesian coordinates], and representing a movement on a plane)
- recognizing, comparing, building, or expressing shapes and solids, including the following:
  - recognizing solids and shapes; classifying them on the basis of properties of sides, angles, or symmetrical elements for shapes and characteristic elements for solids
  - building shapes and drawing them in relation to their properties and measurement instruments (e.g., ruler, compass) in Grades 3 to 6, or protractor at the end of Grade 8; building solids with a variety of materials
  - understanding and stating the properties of sides, angles, median, or diagonals and using them in drawing quadrilaterals or triangles
  - dealing with a solid represented in 2D or in 3D and constructing it

- the identification of patterns, properties, and arguments, including the following:
  - detecting the presence of pattern (axis of symmetry in primary school; translation, axial symmetry, and rotation at the end of Grade 8) and recognizing or building enlargements and reductions of shapes
  - describing the steps of a construction or describing the effect of a transformation on the coordinates of a figure (Grade 8)
  - understanding and using geometric terms to describe, compare, or draw a shape (Grades 3 to 6) and to state or argue a position (Grades 7 and 8)

Measures

The field of measures is separated into the following two dimensions:

- comparing and measuring—From Grades 3 to 6, students learn to understand the sense of measuring and to perform measurements using nonconventional and conventional standards; build procedures and use them for calculating perimeters, areas, and volumes; and establish relationships in a system to make sense of the reading and writing of a measurement. The precise measurement of angles has to be mastered by the end of Grade 8.
- calculating and using fractions—Fractions are introduced in Grades 1 to 6. Students learn to divide objects in order to compare them, compose two fractions of a real object (or a represented one), and add and subtract fractioned measurements or to calculate percentages. Proportionality is referenced in Grades 1 to 8: until Grade 6, by solving simple problems of direct proportionality and in Grades 7 and 8, by working on proportionality tables or determining the relationship between two measurements.

Data Handling

The general goal of this topic is to teach students to understand and analyze data supplied by media and learn to appropriately use this data. Students discover bases of statistical or probability thinking. The following skills are taught in this topic:

- organizing data according to a criterion
- reading a chart, a table, or a diagram (until Grade 6) and interpreting them (Grades 7 and 8)
- representing data on a graph or a diagram (Grades 3 to 6)
- determining the arithmetic mean (Grades 3 to 6), sample size, mode, frequency, and range of values (Grades 7 and 8)
- estimating the frequency of an event in ratio form in a simple and concrete situation (card game, rolling dice, etc.)

As indicated above, a new curriculum will be implemented for Grade 4 in academic year 2023–2024. This referential defines the knowledge, skills, and competencies in connection with mathematics instruction that need to be mastered at the end of each grade of the related common core curriculum.

The Science Curriculum in Primary and Lower Secondary Grades

In the French-speaking Community of Belgium, the Core Skills (*Socles de compétences*) make up the national curriculum that frames the science instruction from Grades 1 to 8. As for mathematics, the Core Skills outline the basis of science instruction for all schools, regardless of the network to which they belong. Nevertheless, instruction methods and classroom activities are not constrained and can vary depending on the network, the type of school, and the teacher. The Core Skills define the competencies that students need to master gradually by the end of Grade 8 and specify the stage of schooling during which these different competencies must first be initiated, then learned, and finally certified. The first eight grades of schooling are divided into three stages: last year of kindergarten to Grade 2, Grades 3 to 6, and Grades 7 and 8.

Teaching science is both about the development of specific and transversal skills and the acquisition of knowledge. Learning the science process is based on the progressive construction of knowledge and skills in which students are the main actors. This implies that teachers propose situations in which students have the opportunity to get involved in research and carry out scientific investigations. For this purpose, three main Know How areas and six main domains of knowledge have been defined. The Know How areas can be developed across all the domains of knowledge.

The three main Know How areas are (1) coming across and grasping a complex reality; (2) investigating research tracks; and (3) structuring results, communicating, validating, and synthesizing them. For each of these three Know How areas, competencies are described.

The Know How area of coming across and grasping a complex reality includes three competencies that are broken down into the following subcompetencies:

- bringing an unsolved enigma to light
- identifying clues and coming up with possible research tracks or investigative steps specific to the situation
- comparing the identified tracks of research, specifying the selection criteria for the tracks, and making a selection according to the criteria

The Know How area of investigating research tracks includes two competencies that are broken down into the following subcompetencies:[4]

- collecting information through experimental research, observation, and measurement
- collating information through a literature search and consultation with key informants

Finally, the Know How area of structuring results, communicating, validating, and synthesizing them includes two competencies that are broken down into the following subcompetencies:

- collecting and organizing information in a way that fosters understanding and communication
- questioning the research results, synthesizing them, and building new knowledge

Most of these subcompetencies are requested to be introduced (initiated) at Grade 1, but only some of them must be certified at this grade. Moreover, some subcompetencies are requested to be certified at each stage of schooling but with a progressive level of difficulty.

All of these Know How areas can be developed across the six main domains of knowledge: Living Beings; Energy; Matter; Air, Water, and Land; People and the Environment; and History of Life Sciences. Each domain of knowledge includes themes and subthemes that are listed in Exhibit 1.

The domain of knowledge Living Beings includes several themes and subthemes. The first theme is the characteristics of living beings. Four characteristics can be addressed, such as the organization of living beings in terms of structure (not in terms of definition). This includes several levels like organ, apparatus and system, organism, population, community, and biotope. The second characteristic is the way living beings respond to stimuli in their environment, as well as changes in their environment. The third characteristic is the way living beings metabolize, or how living organisms produce energy necessary for their daily needs, growth, repair, etc. Finally, the fourth characteristic concerns the life cycle of living beings, including reproduction, adaptation, and evolution over several generations. The second theme included in the Living Beings domain of knowledge is the organism. In this theme, descriptive anatomy is addressed in general (humans, animals, plants) in its functional aspect, through the linking of different organs and systems in their complementarity and in raising awareness about a healthy lifestyle. The physiological aspects are omitted. The third theme of Living Beings is the relationships between living things and their environment (food relationships, competition, cooperation). The last theme is classification of living beings (e.g., living/nonliving beings, the five kingdoms, the branches and classes of vertebrae).

The second domain of knowledge is Energy. Five themes are included in this domain. The first theme focuses on general knowledge about energy: the main sources of energy, different forms of energy, transformations of energy, and some forms of energy storage. Energy conservation is omitted. The second theme is electricity. This theme covers topics like electricity as the result of the conversion of energy, the conversion of electrical energy into other forms of energy, the simple electric circuit, and good and bad conductors. The relationship between electrical energy and magnetism is omitted. The third theme is light and sound. In this theme, different topics are initiated but not certified: distinction between luminous and nonluminous bodies; colors as characteristics of light, shadow, and darkness; propagation of light and sound; production and characteristics of different sounds; perception of vibrations; etc. The main properties of light, light energy, and photosynthesis, as well as the characteristics of a force, are omitted. The fourth theme concerns forces. This theme includes demonstration of force by its visible effects, the principle of action-reaction, and approaches to the relationship between mass/weight and pressure (relationship between strength/surface). The last theme is heat and concerns the distinction between heat and temperature, transformation of different forms of energy into thermal energy, heat transfer in different states of matter, the qualities of a good thermal insulator, and expansion/contraction.

The third domain of knowledge is Matter. This domain includes two themes: properties and changes, and pure bodies and mixture. Properties and changes concern knowledge like the states of matter, properties of each state of matter, changes of state (qualitative aspect), the relationship between heat input and release and changes of state, physical characteristics of some substances, and the distinction between reversible and irreversible phenomena. The theme of pure bodies and mixture includes the molecular aspect of matter; the relationship between the molecular model, the states of matter, and their properties; the difference between pure bodies and mixture in terms of composition; homogeneous and heterogeneous mixtures; and identification of several techniques for separating mixtures.

The fourth domain of knowledge is Air, Water, and Land. Composition of the air, the relationship between oxygen in the air and water, atmospheric pressure, states of water (solid, liquid, gas), different forms of water (e.g., snow, fog, frost), factors that affect the evaporation of water, the water cycle, and characteristics of a weather report must be initiated and certified at different stages. Topics about land must be initiated but not certified. They include the distinction between soil and subsoil; the characteristics of land in relation to its composition; land as a living environment; classification of rocks; and the effects of sunlight, wind, and ice on land relief and soils.

The fifth domain of knowledge is People and the Environment. The main objective is to act in an informed manner for the benefit of all people. Here, science teaching contributes to the development of skills. Environmental education (management, conservation, protection, use of resources and destruction, pollution, etc.) should not be certified but rather focused on constantly raising awareness.

The last domain of knowledge is History of Life Science. This domain includes formation of the universe, emergence of life, evolution and extinction of species, mankind in evolution, temporary and evolutionary aspects of scientific theories, critical approach to the consequences of scientific research, and technological applications. These topics must be initiated but not certified.

Exhibit 1: Description of Knowledge Domains in Science

Domain of Knowledge	Themes	Subthemes
Living Beings	characteristics	• organization of living beings • how living beings respond • how living beings metabolize • life cycles of living beings
	the organism	
	relationships between living things and their environment	• food relationships • other types of relationships
	classification	
Energy	general knowledge	
	electricity	
	light and sound	
	forces	
	heat	
Matter	properties and changes	
	pure bodies and mixtures	
Air, Water, and Land	air and water	
	land	
People and the Environment		
History of Life Sciences		

Teacher Professional Development Requirements and Programs

Professional development of teachers is compulsory per decree.[5] Currently, professional development projects are structured at two levels:[6]

- school level—training to meet needs identified collectively when drawing up the school's training plan (compulsory participation by members of the education team, i.e., 18 days of training to be spread over 6 consecutive school years, plus any additional training required by the government)
- individual level—training to meet individual needs (optional and voluntary participation by members of the education team, with a maximum of 30 days' training spread over 6 consecutive school years)

Monitoring Student Progress in Mathematics and Science

In 2006, Parliament adopted a decree to organize and coordinate the previous system of external noncertifying assessments into a 3-year cycle. For the first year, assessments focus on reading mastery and writing for students in Grades 2 and 5. Mathematics is assessed in the second year, followed by science in the third year. The team that oversees these assessments includes the president of the Monitoring Commission, teachers from various education bodies, inspectors, and university researchers. The assessment results are used to evaluate student achievement, prepare pedagogical recommendations and activities for teachers, develop in-service professional development training, and help pedagogical counselors.

Since 2008, a Basic Studies Certificate has been awarded at the end of primary education based on an external certifying assessment, which is compulsory.[7] This examination assesses the mastery of the expected competencies at the end of primary education in French language, mathematics, science, history, and geography. Alternatively, students can obtain a Basic Studies Certificate through the Board of Examiners at their school. As of academic year 2013–2014, a First-Degree Certificate is awarded at the end of Grade 8 based on an external certifying assessment. This examination assesses mastery of the expected competencies at the end of Grade 8 in French language, mathematics, science, and modern languages.

Various methods of assessment are used in primary education (summative, certifying, and formative assessments). In order to enable students to develop at their own pace, teachers should focus on formative assessment and differentiated education that takes into account students' different abilities. The results of teacher-prepared examinations can supplement classroom observations and notations from formative assessments.

To assist teachers, the Commission of the Assessment Instruments Related to Core Skills (*Commission des Outils d'Évaluation Relatifs aux Socles de Compétences*) provides examples of assessments to all schools organized and subsidized by FWB. These instruments have been developed to align with the Core Skills. Prior to their distribution, the assessments are tested in classrooms.

Special Initiatives in Mathematics and Science Education

The *Rallye Mathématique Transalpin* (RMT) is a problem-solving competition that takes place in Italy, France, Switzerland, Luxembourg, and Belgium. The RMT is organized in FWB for classes in Grades 3 to 8. To participate in the RMT, the teacher has to register the entire class: All students in the class must participate in this collaborative competition.[a]

The Belgian Mathematical Olympiad (OMB) is an individual mathematics competition for students in Grades 7 to 12. This competition is organized in three rounds (elimination, semifinal, and final) and asks questions mainly focused on mathematical reasoning.

a See https://rmt-belgique.be/ for more information.

The association *Math en jeans* aims to improve the image of mathematics by making young students discover a playful facet of the world of research. The project is based on workshops conducted in schools in collaboration with secondary school students and teachers. Together, they seek answers to a research problem proposed by researchers. The research is done throughout the year in small groups of students assisted by their teacher and ends at the end of the year with the presentation of results at a congress bringing together all the participating schools.

Printemps des Sciences is the annual meeting of scientific and technological culture (science, technology, engineering, and mathematics [STEM]) in the French Community of Belgium. Many activities (workshops, laboratories, experiments, public demonstrations, shows, screenings, conferences, etc.) are offered to students in preschool to the end of secondary school. These activities are proposed by teachers, researchers, and students from universities and their partners (museums, associations, etc.).

Suggested Reading

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3 Fédération Wallonie-Bruxelles. (2014). *Statement of community policy 2014–2019*. https://www.wallonie.be/sites/default/files/2019-09/declaration_politique_regionale_2019-2024.pdf

4 Ministère de la Communauté française, Administration générale de l'Enseignement et de la Recherche scientifique. (1999). *Socles de compétences* [Core skills]. Brussels: Author. Retrieved from http://www.enseignement.be/index.php?page=24737

5 Gouvernement de la Communauté française. (2019). *Le Code de l'enseignement fondamental et de l'enseignement secondaire*. Brussels: Author.

6 La Ministre-Présidente de la Communauté française, en charge de l'Enseignement obligatoire et de promotion sociale. (2022). *Circulaire N° 8742 du 26 septembre 2023. Mise en oeuvre de la formation professionnelle continue (FPC) des membres de l'équipe éducative des écoles et des membres du personnel de l'équipe pluridisciplinaire des Centres PMS: rentrée scolaire 2022/2023* [Career training: Teaching basic regular school year 2022–2023]. Brussels: Author.

[7] Gouvernement de la Communauté française. (2006). *Décret relatif à l'évaluation externe des acquis des élèves de l'enseignement obligatoire et au certificat d'études de base au terme de l'enseignement primaire* [Decree on the external evaluation of student achievement in compulsory education and basic education certificate at the end of primary education]. Brussels: Author.