Belgium (Flemish)

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Introduction

Overview of Education System

Belgium is a federal state, composed of communities and regions. There are three communities: the Flemish community, the French community, and the German-speaking community.[1] Education in Belgium is mostly regulated and financed by these communities. The federal government plays only a small role: determining the beginning and end of compulsory education, defining minimum requirements for issuing diplomas, and regulating the retirement of education staff. In Flanders, the Ministry of Education and Training, led by the Minister of Education, is responsible for all stages of education and training, from preschool education to university and adult education.

Education in Belgium is compulsory between ages 6 and 18, or until graduation from secondary school. Nearly all children in Flanders attend preschool (ages 2½ to 6). To be allowed to enroll in primary school, a child must have attended preschool for at least 250 half days during the calendar year in which the child turns 6. If the child was not sufficiently present, the primary school's class council decides whether or not the child can start primary education. If not, the child must attend preschool education for another year.

Compulsory education starts on September 1 of the year in which a child turns 6 and ends in June of the year in which he or she turns 18. Thus, there are 12 years of compulsory schooling, comprising 6 years of primary education and 6 years of secondary education. Full-time education is compulsory until students turn 15 or 16. After age 15 or 16, students may continue their education on a part-time basis, but most students continue with full-time secondary education.

In addition to several types of mainstream education, the education system includes preschool, primary, and secondary education for children with special needs. Special needs education is organized for children who need specific temporary or permanent support because of physical or mental disabilities, serious behavioral or emotional problems, or severe learning disabilities. On March 12, 2014, the Flemish Parliament approved the M-decree, which includes measures for students with specific needs in order to make education more inclusive. The decree contains

measures that enable students with specific educational needs to participate fully, effectively, and on equal terms in mainstream schools and classrooms. Besides mainstream and special needs education, homeschooling is also allowed. Furthermore, children who are unable to attend school, primarily due to serious disabilities, may be exempted from compulsory education.

Most schools in Flanders are part of an education network. In Flanders, the education landscape is dominated by three education networks:

- GO! Education is the official education network organized by the Flemish Community.
- Government-aided public education comprises schools run by municipal or provincial authorities.
- Government-aided private education is organized by a private person or organization. The network consists mainly of Catholic schools. It also includes schools not linked to a religion (e.g. Freinet, Montessori, or Steiner schools) that apply specific teaching methods.

The school boards of an education network may join an umbrella organization.

The Flemish government establishes the developmental objectives and national attainment targets for primary education. Based on these, Flemish school network organisations write their own curricula and schedules. Therefore, primary schools can have different objectives in different grades depending on the school's education network.[2]

Quality control and quality promotion in Flemish Community education are based on three pillars:

- The attainment of targets, which provide a clear frame of reference regarding quality, embedded in society
- The Flemish Inspectorate, which works on behalf of the Flemish government and is responsible for overseeing the quality of education; every institution is subjected to at least one full inspection every 10 years
- Pedagogical counseling services organized by nonprofit associations, set up by education umbrella organizations to support education institutions in realizing their pedagogical or social science projects and promoting quality of education and student guidance

The Flemish government defines criteria for monitoring the quality of curricula for each organizing authority or school board and approves curricula based on the established minimum attainment targets and development objectives. The government's inspectorate evaluates whether schools are making sufficient effort to reach these attainment targets. In addition, the government examines whether schools reach curriculum-based objectives, and whether they sufficiently pursue developmental objectives and cross-curricular attainment targets.

Use and Impact of TIMSS

Flanders has had a longstanding tradition of participating in TIMSS, more precisely since 1995. In the earlier cycles, Flanders participated at the eighth grade, and in the later cycles, at the fourth grade. International large-scale assessments such as TIMSS are highly valued. Schools are interested to see how Flanders performs compared with other education systems.

International surveys such as TIMSS receive a lot of media attention. However, a direct impact of TIMSS results on daily educational practice cannot be observed. Impact of TIMSS should be considered together with other international large-scale assessments in which Flanders participates (e.g. the Programme for International Student Assessment [PISA] and the Progress in International Reading Literacy Study [PIRLS]). Past cycles of these studies have triggered a debate on the quality of education. TIMSS has not had a large impact within the Flemish Community, probably because the overall results of past cycles were relatively good.[3] In recent years, however, the focus on education in science, technology, engineering, and mathematics (STEM) has increased, partially due to the TIMSS results. An important impact of TIMSS in past cycles may have been that people from other regions and countries learned that the education system in Flanders is rather effective.[4]

The Mathematics Curriculum in Primary and Lower Secondary Grades

In primary schools, mathematics education includes a number of important areas that are described in the national attainment targets for primary education and that apply to all schools in their respective umbrella organizations. These national attainment targets aim to help students achieve the following goals:[5]

- Acquire basic mathematical knowledge, insights, and skills (such as symbols, terms, concepts, and procedures) that are necessary to function adequately in society and/or form an essential basis for future study or a future career
- Apply acquired mathematical knowledge, insights, and skills in meaningful concrete and real-world situations, as well as in other learning areas
- Understand the language of mathematics
- Develop an inquisitive attitude and skills that can help them discover and investigate mathematical relationships, patterns, and structures
- Use appropriate research strategies to solve mathematical problems
- Learn to regulate their own mathematical reasoning and learning processes and to reflect on them
- Develop a constructive critical attitude toward mathematics in general
- Develop a positive attitude toward mathematics as a learning area

Exhibit 1 presents a summary of the domains and objectives in the mathematics curriculum at the primary level (Grades 1 to 6).

Exhibit 1: Summary of Domains and Objectives in the Mathematics Curriculum in Primary School[6]

Domain	Objectives
Numbers and Operations	▪ Knowledge of the concept of quantity and functions of numbers, and of the various ways of expressing quantities with numbers (e.g. natural numbers, whole numbers, decimals, and fractions) ▪ Mental and written arithmetic operations (i.e. addition, subtraction, multiplication, and division) ▪ Knowledge of other number systems (in history and non-Western cultures) ▪ Knowledge of multiplication tables and ability to discover number patterns and characteristics of divisibility (of 2, 3, 5, 9, 10) ▪ Discovering and applying properties of operations ▪ Determining which mathematical operations with regard to numbers apply in specific contexts and which are the most appropriate and economical ▪ Making plausible estimations ▪ Calculating fractions, decimals, and percentages ▪ Using a calculator
Measurement	▪ Knowledge of the most important quantities and units of measurement with regard to length, area, content, weight (mass), time, speed, temperature, and angle ▪ Knowledge of the symbols, notation, and conventions of units of measurement ▪ Measuring physical objects, including various skills for use outside the classroom ▪ Measuring physical variables (e.g. distance, mass, time, and temperature), and using scale and average ▪ Reading and using units of measurement to measure and calculate geometric variables (e.g. perimeter and surface area, volume of a rectangular cuboid) ▪ Calculating with money and monetary values in real situations ▪ Working with units of measurement ▪ Associating units of measurements with meaningful situations and estimating measurement results ▪ Telling time on a clock (analog and digital), calculating time intervals, and knowing the relationship between seconds, minutes, and hours
Geometry	▪ Recognizing and naming shapes (points, lines, angles, triangles, quadrangles, circles, cubes, rectangular cuboids, pyramids, spheres, and cylinders) and relations (perpendicular and parallel) ▪ Reasoning with geometric properties (e.g., classifying quadrangles, symmetry, and equality) ▪ Finding connections between shape and size (e.g. similarity and congruence). ▪ Making simple geometric constructions ▪ Understanding concepts related to orientation and location in two-dimensional space (based on plans, maps, photos, and data on distance and direction)
Strategies and Problem Solving Skills	▪ Recognizing the process- and problem-oriented nature of mathematics ▪ Applying acquired insights and concepts (e.g. the practical value of mathematics and problem solving)
Attitudes	▪ Appreciating mathematics as a dimension of human inventiveness ▪ Developing a critical attitude toward figures, tables, and calculations that are used to inform, convince, and mislead people ▪ Experiencing mathematics an active and constructive process that can grow and expand as a result of one's thinking and learning activities ▪ Being prepared to reflect on their approach before, during, and after solving a mathematical problem and being prepared to adjust their approach based on this reflection

Secondary education consists of three grades. The first grade is divided into Streams A and B. The A stream is organized for most students with a certificate of primary education. The B stream is for students without a certificate of primary education or students who are less apt at predominantly theoretical education. After the first grade, B stream students can continue with a prevocational year or move to the first grade A stream. As of September 1, 2019, both streams have new attainment targets. Below, we briefly describe the new attainment targets for mathematics in the first grade of secondary education. The underlying targets can differ for the A and B streams.

A and B stream attainment targets include modeling and solving problems by analyzing, (de)mathematizing, or applying heuristics, as well as developing insight in the following areas:

- Numbers and quantities: number theory
- Space and form: geometry and measurement
- Relations and change, such as algebra, analysis, and discrete structures
- Data and uncertainty, such as probability and statistics

An attainment target for A stream only is constructing argumentations and making them abstract, taking into account the coherence and structure of mathematics.

The Science Curriculum in Primary and Lower Secondary Grades

In primary education, science is taught as part of World Studies, which comprises six domains (Nature, Technology, Man, Society, Time, and Space). Starting September 1 2015, the government divided this topic into two new subject areas: Science and Technology (comprising nature and technology, use of resources, time, and space) and Human and Society (comprising humankind and society).[7,8] The science education attainment targets at the primary level are part of the Science and Technology domain. Students acquire knowledge, understanding, skills, and attitudes about animate/living nature (e.g., people, animals, and plants) and inanimate/nonliving nature (e.g. weather and climate, the universe, and materials). Objectives in health and environmental education are linked to this content.

Exhibit 2 presents a summary of the domains and objectives in the science curriculum at primary level (Grades 1 to 6). Several topics included in the fourth grade TIMSS assessment are introduced in fifth or sixth grade in Flanders and therefore, are not part of the fourth grade curriculum. As a result, students might not be prepared for some of the fourth grade TIMSS science items and underperform on them during the assessment.

Exhibit 2: Summary of Domains and Objectives in the Science Curriculum in Primary School[9]

Domain	Objectives
General Skills	▪ Making specific observations with all the senses and systematically recording these observations ▪ Testing at least one natural phenomenon that they observe against a hypothesis through a simple experiment under supervision
Living and Nonliving Nature	▪ Discovering similarities and differences in a collection of organisms and common materials and applying and justifying their own organization, based on at least one criterion ▪ Naming two biotopes in their environment and recognizing and naming their common organisms ▪ Identifying characteristics of organisms that illustrate that they are adapted to their environment ▪ Illustrating how humans influence the presence of organisms ▪ Illustrating the principle of "eat or be eaten" based on at least two linked food chains ▪ Naming the function of important organs involved in breathing, digestion, and circulation in the human body ▪ Naming the function of the senses, the skeleton, and the muscles ▪ Recognizing physical changes in themselves and their peers as normal aspects of their development ▪ Measuring, comparing, and describing weather elements at a specific time, as well as over a limited period ▪ Illustrating the connection between people's living habits and the climate in which they live ▪ Showing how the Earth rotates around its own axis, the effect this rotation has on the rhythm of day and night, and how the Earth, the Sun, and the Moon move relative to each other ▪ Demonstrating the properties of common materials in their environment ▪ Illustrating that a substance can change state ▪ Giving examples to demonstrate how energy is needed for the functioning of living and nonliving systems and naming the energy sources
Health	▪ Correlating healthy and unhealthy life habits to what they know about the functioning of their own bodies ▪ Knowing that certain disease symptoms and disabilities cannot always be avoided ▪ Realizing that precautions can reduce the risk of illness and accidents ▪ Being able to request the help of an adult in an emergency situation ▪ Being able to provide basic help for treating burn wounds
Environment	▪ Being able to independently perform basic actions when caring for animals and plants in their environment ▪ Being prepared to handle waste, energy, paper, food, and water with care in their class and school ▪ Using concrete examples from their environment to illustrate how humans treat the environment in a positive as well as negative way ▪ Using concrete examples from their environment to illustrate how environmental problems are often based on conflicting interests ▪ Showing respect and care for nature based on the awareness that people depend on the natural environment for their life necessities

Domain	Objectives
Technology	▪ Knowing what materials or raw materials make up technical systems in their environment ▪ Using examples from different fields of technology to illustrate that technical systems can be useful as well as dangerous and/or harmful to themselves, to others, or to nature and the environment

Secondary education consists of three grades. The first grade is divided into an A stream and a B stream. As of September 1, 2019, both streams have new attainment targets. Below, the new attainment targets for science and techniques in the first grade of secondary education are described briefly. The underlying targets can differ for the A and B streams. New attainment targets include developing insight into:

- The construction, structure, and properties of matter in living and nonliving systems
- The manifestations of energy, the interaction between matter and energy, and the consequences thereof
- The basic properties of living systems
- Technical systems and processes and their relationship to different technological domains and to other domains (sciences, mathematics, etc.)
- Designing, implementing, deploying, and evaluating technical systems, taking into account fundamental social, scientific, and technological aspects
- Using natural science and technological and mathematical concepts and methods to solve problems and to investigate and understand objects, systems, and their interactions

Professional Development Requirements and Programs

During initial teacher training for primary education, students are trained in all subjects of primary education. Therefore, there are no subject-specific teachers for mathematics or science in primary education. Students of the Bachelor of Secondary Education choose two core subjects. Therefore, in eighth grade there are subject-specific teachers for mathematics and science. In 2012, the Flemish Government outlined the general framework of an action plan to promote careers in mathematics, exact sciences, and technology (known as the STEM Action Plan 2012–2020; see also Special Initiatives in Mathematics and Science Education). This plan has led to an increase in initiatives to support professional development for teachers related to mathematics and science issues.

Monitoring Student Progress in Mathematics and Science

There are no central examinations in Flanders. However, every year, the Flemish Ministry of Education organizes low-stakes, sample-based assessments to test Flemish students' achievement in the attainment targets for primary education. Assessments in mathematics took place in 2002, 2009, and 2016. Assessments in World Studies (including science) took place in 2005 and 2015. These assessments are used for research purposes and to inform policy.

Schools use their own tests and qualification standards to determine whether students have attained national targets and school-specific objectives. Schools are obliged to assess their students at the end of primary education, but they are free to choose the assessment tool. The aforementioned umbrella organizations establish their own standardized assessments:

- Catholic Education Flanders organizes annual interdiocesan tests in the fourth and sixth grades. Schools are free to choose whether the fourth grade participates. These tests can be used for internal quality development at the schools. The interdiocesan tests cover mathematics, Dutch, World Studies (including science, history, geography, etc.), and in Grade 6, French.
- *OVSG* organises the *OVSG* test, which is an all-talent test for the sixth grade in primary school. The test consists of both practical tests during the school year and written tests in June. Students are tested in all domains for which final objectives have been formulated; therefore, they also evaluate mathematics and science skills.
- GO! uses the same evaluation instrument as *OVSG*—i.e., the *OVSG* test.

In primary education, teachers conduct tests every year to assess student achievement against prescribed objectives and to evaluate their teaching efficacy. Tests are administered mainly in December and June. Test results are considered together with other assessments retrieved throughout the school year. Most Flemish schools use a set of educational materials from an educational publisher for mathematics and/or science that includes tests. For mathematics, in addition to these tests, follow-up assessments are administered independent of the method used to verify students' achievement level. For science, teachers can develop tests independently to suit their own curriculum. On a regular basis, school reports inform students and their parents of students' assessment results, progress, attitude toward learning, and personal development.

The Decree on Student Counselling in primary education, secondary education, and the Student Counselling Centres (*CLBs*) came into effect on 1 September 2018.[10] Every school should develop, implement, and evaluate a student counselling policy. The implementation of a student counselling policy is a requirement to be recognized as a school. This integrated policy comprises four guidance areas: educational careers, learning and studying, psychological and social functioning, and preventive health care. The school provides basic care for all students and increased care for students who need it. The basic care is based on a vision of student counselling and stimulates the development of all students. The entire school team, parents, and students have a say in this policy. In this way, it is supported by everyone. The school includes all information about student counselling in the school regulations. Primary education schools integrate their existing care policy into their student counselling policy. Student counselling is an integral part of the educational events in the school. When developing student counselling policies, the school takes into account the needs of its student population and the school context.

Special Initiatives in Mathematics and Science Education

As in many other countries, the Flemish labor market has been struggling with a shortage of technical and scientific workers.[11] The Flemish government addressed this issue with the STEM Action Plan 2012–2020, which was developed to encourage young people to choose STEM-related subjects at school and, ultimately to pursue a STEM career.

The Action Plan advocates for STEM education that is innovative and thematically challenging. It has eight objectives:

- To organize attractive STEM education
- To reinforce teachers, trainers, and mentors
- To improve the study and career choice process
- To attract more girls to STEM courses and professions
- To focus on excellence
- To adjust the courses provided
- To encourage sectors, companies, and knowledge institutions
- To enhance society's appreciation of technical professions

Schools were experiencing a need to integrate mathematics, science, and technology instruction. Mathematics and science instruction was often too abstract and thus demotivating for students. To ensure that important STEM concepts and practices are understood and applied in an interdisciplinary manner,[12,13] a framework was especially designed for preschool, primary, and secondary education. Furthermore, Communities of Practice were developed in preschool, primary and secondary education, where teachers inform and encourage each other with regard to STEM. The Inspectorate evaluated the quality of preschool, primary, and secondary STEM education using a quality framework that inspires assessment of existing practices while describing a potential growth path.[14] STEM is also high on the agenda of preservice teacher training institutions.

Apart from formal education, more than 60 out-of-school STEM academies are active and offer interactive STEM activities in a nonformal setting. However, being nonformal, they often work closely with schools.

Suggested Readings

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