Ireland

Department of Education and Skills
National Council for Curriculum and Assessment

Eemer Eivers
Educational Research Centre

Introduction

Overview of the Education System

Ireland's education system is largely centralized. Overall responsibility for education lies with the Minister for Education and Skills, who is a member of the Irish government and responsible to the national parliament. In practice, the Department of Education and Skills (DES), together with a number of bodies under its aegis, is responsible for running the Irish education system. Almost all primary and post-primary schools are state-funded, and are required to operate under both the Education Act (1998)[1] and the curriculum, assessment, and evaluation framework established by the DES, based on advice from the National Council for Curriculum and Assessment (NCCA). The NCCA is a statutory body with responsibility for advising the Education Minister on curriculum and assessment for early childhood education and for primary and post-primary schools. The inspectorate division of the DES has responsibility for evaluating and reporting on educational provision in all primary and post-primary schools and centers of education that are supported by the Department. Although state-funded, the majority of schools are owned and managed by private organizations, mainly church authorities or religious orders. Individual boards of management govern each school, which are expected to operate in accordance with centrally agreed-upon procedures.

The Irish education system comprises primary, post-primary, third-level, and further education. In addition, parents can send their children to one year of early childhood care and education, prior to starting primary school. Primary schools operate an eight-year program, consisting of two pre-primary years (Junior Infants and Senior Infants), followed by Grades (Classes) 1–6. A child must be four years old at the start of the school year (September) to enroll in primary school. Most children start school as Junior Infants, at either four or five years of age.

The Irish primary education sector comprises state-funded primary schools, special schools, and private primary schools. The 3,165 state-funded primary schools include religious schools, non-denominational schools, multi-denominational schools, and *scoileanna lán-Ghaeilge* (Irish-medium schools). All state-funded schools follow the Primary School Curriculum[2] and private schools offer a broadly similar curriculum.

Ireland has some variation in post-primary school types (e.g., vocational schools, comprehensive schools, and privately-owned and managed secondary schools). However, the curriculum offered in all is substantially the same. Second-level education consists of a three-year junior cycle followed by a two-year senior cycle. Senior cycle can extend to three years if students opt to complete a "Transition Year" (a year free from formal examinations that allows students to experience a range of educational inputs, including work experience) following completion of junior cycle. Senior cycle students follow one of three programs, each leading to a terminal state examination: the Leaving Certificate, the Leaving Certificate Vocational Programme, or the Leaving Certificate Applied.

At both lower and upper secondary school, students choose one of three levels for mathematics (higher, ordinary, or foundation). At lower secondary, science students are tracked into either higher or ordinary levels of combined science classes, while, at upper secondary, students enroll in individual science subjects, certified at either higher or ordinary level. Differences between levels are mainly in terms of depth, and all sciences have practical elements built into their syllabuses.

In 2011, the DES launched "Literacy and Numeracy for Learning and Life," a comprehensive national strategy to improve literacy and numeracy standards.[3] The strategy complements initiatives such as Maths Week Ireland (an annual, all-island celebration of mathematics) and Discover Science & Engineering (a national science promotion program aiming to increase interest in science, technology, engineering, and mathematics among students, teachers, and members of the public). Further, the annual Young Scientist and Technology Exhibition, funded by private sponsors and supported by the DES, plays a major role in promoting scientific education. For example, the 2010 Exhibition attracted over 1,700 student entrants, and over 40,000—mainly student—attendees.

At the secondary level, both mathematics and science have recently received additional funding. The "Project Maths" initiative is implementing a

new mathematics curriculum, with associated professional development, at both lower and upper secondary levels. Generally, the DES funds mathematics and science education, with additional per capita grants for students who study in the physics and chemistry programs leading to the Leaving Certificate.

Languages of Instruction

Ireland is officially a bilingual state; Irish is the national and first official language, and English is recognized as a second official language.[4] In practice, almost all people speak English on a daily basis, while the most recent census data available (2006) indicate that approximately 41 percent of the population are able to speak Irish.[5] Irish is the community language in pockets of *Gaeltacht* (Irish-speaking) areas and is used daily by some people outside the *Gaeltacht*. The Government aims to ensure that as many citizens as possible are bilingual (Irish and English) and is committed to providing the option of Irish-medium education, both in *Gaeltacht* and non-*Gaeltacht* areas. Thus, in addition to English-medium schools, Ireland has Irish-medium primary and post-primary schools in *Gaeltacht* areas, and a network of Irish-medium schools in non-*Gaeltacht* areas (*scoileanna lán-Ghaeilge*). Because fluency in Irish is not a requirement for enrolment at Irish-medium schools, Irish is often not the mother tongue of students attending these schools. In English-medium schools, English is the medium of instruction for mathematics and science at all grades. In Irish-medium schools, Irish is usually the medium of instruction for mathematics. Until relatively recently, a perceived limited range of science texts available in Irish meant that primary-level science was sometimes taught in English. Currently, science in Irish-medium schools is typically taught in Irish, at both fourth and eighth grades.

Mathematics Curriculum in Primary and Lower Secondary Grades

The mathematics component of the Primary School Curriculum is for all students from junior infants (pre-primary) to sixth grade.[6, 7] The mathematics curriculum aims to help all students to achieve the following:

- Develop a positive attitude towards the subject and to appreciate its practical application in life;
- Develop problem-solving skills and the ability to use mathematics in everyday life;
- Use mathematical language effectively and accurately;

- Understand mathematical concepts and processes at a level commensurate with their development and ability; and
- Become proficient in fundamental mathematical skills and in recalling basic number facts.

At fourth grade, the curriculum is presented in five strands: Number, Algebra, Shape and Space, Measures, and Data. The strands are interrelated, so student understanding in one area is dependent on, and supportive of, ideas and concepts in other strands. The strands are divided into strand units, in which student learning is described using content objectives.

Unlike the rest of the Primary School Curriculum, in which learning content for subjects is grouped in two-year grade bands, mathematics learning content is grade-specific. Exhibit 1 shows the curriculum strands and strand units for fourth grade, and provides some specific examples of the types of skills developed.

Exhibit 1: Summary of the Mathematics Curriculum, Grade 4, with Sample Skills

Strand	Strand Unit	Mathematical Learning
Number	Place Value	Round whole numbers to nearest 1,000.
	Operations	Solve word problems involving adding and subtracting numbers 0–9,999.
	Fractions	Solve problems involving fractions.
	Decimals	Order decimals on the number line.
Algebra	Number Patterns and Sequences	Explore, recognize, and record patterns in numbers, 0–9,999; describe sequences.
	Number Sentences	Translate a one-step word problem into a number sentence, and solve.
Shape and Space	Two-dimensional Shapes	Identify, classify, compare, draw, tessellate, and make patterns with two-dimensional shapes.
	Three-dimensional Shapes	Identify, classify, and construct three-dimensional shapes; and Describe relationship of three-dimensional shapes with constituent two-dimensional shapes.
	Symmetry	Use understanding of line symmetry to complete missing half of a shape, picture, or pattern.
	Lines and Angles	Describe intersecting lines and their angles. Classify angles as greater than, less than, or equal to a right angle.

Strand	Strand Unit	Mathematical Learning
Measures	Length	Units of length (m, cm, km): addition, subtraction, multiplication, and simple division.
	Area	Estimate, compare, and measure the area of regular and irregular shapes (cm^2, m^2).
	Weight	Units of weight (kg, g): addition, subtraction, multiplication, and simple division.
	Capacity	Units of capacity (l, ml): addition, subtraction, multiplication, and simple division.
	Time	Times and dates, and the addition and subtraction of hours and minutes.
	Money	Money (euro and cent): addition, subtraction, multiplication, and simple division.
Data	Representing and Interpreting Data	Use data sets.
	Chance	Identify and record outcomes of simple random processes.

Spanning the content outlined in Exhibit 1 are the skills that students should acquire through their mathematical work. These include applying and problem-solving, understanding and recalling, communicating and expressing, integrating and connecting, reasoning, and implementing.

Based on a constructivist approach to learning, the primary school mathematics curriculum places importance on practical experience, whereby students manipulate and use objects and equipment as they develop mathematical concepts and extend their thinking. The curriculum also highlights the significant role of discussion among students, and between teacher and students during mathematical activities. This is considered especially important in helping students make the transition to mathematical symbols and expressions. The curriculum also highlights the importance of helping students develop an understanding of the structure of numbers, and acknowledges the critical role that calculators can play in this aspect of their learning from fourth grade onwards, by which time students are expected to have acquired a mastery of basic number facts and a facility in their use.

The curriculum puts considerable emphasis on mental calculations and the importance of supporting students' use of these in estimating and problem solving. In this way, students are helped to see mathematics as practical, relevant, and important. Given the pervasive nature of mathematics in everyday life, the curriculum also highlights the importance of integration, whereby students have opportunities to use their mathematical understanding and skills in other subjects.

The mathematics curriculum, as experienced in Irish lower secondary level classrooms, is currently being revised. A curriculum and assessment initiative, Project Maths, was introduced to address concerns about the low levels of mathematical ability evident in national and international tests. The initiative includes syllabus changes on a phased basis, accompanied by changes in examinations. The new syllabus strands were introduced in a pilot set of schools in September 2008, and are gradually being implemented in all schools. However, the curriculum in place for the vast majority of lower secondary students in 2010 was that which was introduced in 2000, and it is described next.

The general aims of the 2000 syllabus are to contribute to the personal development of the students and to help provide them with the mathematical knowledge, skills, and understanding needed for continuing their education, and eventually for life and work.

Upon completion of lower secondary school, students should be able to do the following:

- Recall basic facts;
- Demonstrate instrumental understanding;
- Acquire relational understanding;
- Apply their knowledge and skills;
- Analyze information, including information presented in cross-curricular and unfamiliar contexts;
- Create mathematics for themselves;
- Demonstrate the psychomotor skills necessary for the tasks described above;
- Communicate mathematics, both verbally and in written form; and
- Appreciate mathematics and be aware of its history.

Apart from general syllabus aims and objectives, the lower secondary mathematics curriculum also contains level-specific aims and assessment objectives. The main syllabus topics at each level are: sets, number systems (natural numbers, integers, and rational numbers), applied arithmetic and measure, algebra, statistics, geometry (synthetic, transformation, coordinate), trigonometry, and functions and graphs.

Each topic is presented in detail as a list of syllabus "content." Knowledge of mathematics from the Primary School Curriculum (1999) is assumed.

Mathematics is formally assessed as part of the terminal examinations for lower secondary (Junior Certificate), prepared by the State Examinations Commission. Candidates at ordinary and higher levels take two examinations, while candidates at foundation level take one examination. Coinciding with the introduction of the syllabus in 2000, calculator use in all subjects was permitted in the Junior Certificate Examination and their appropriate use in teaching and learning was assumed.

In contrast, the mathematics syllabus being introduced under Project Maths is presented in five strands: statistics and probability, geometry and trigonometry, number, algebra, and functions. Greater emphasis will be given to student understanding of mathematical concepts and the development of knowledge and skills, as well as their application in a problem-solving approach to familiar and unfamiliar situations and to real-life contexts. The syllabus based on Project Maths will be presented at two levels (or tracks): ordinary and higher.[a] The initiative aims to increase the student cohort taking higher level mathematics by 10 percent.

To promote continuity with mathematics learned in primary school, the National Council for Curriculum and Assessment (NCCA) developed a bridging framework,[8] including a common introductory course specified for the start of Junior Cycle (lower secondary) education.

Science Curriculum in Primary and Lower Secondary Grades

Science, together with history and geography, is part of Social, Environmental, and Scientific Education in the Primary School Curriculum in Ireland. The current curriculum was officially introduced to schools in 2003–04, following appropriate professional development for teachers the previous school year. The science curriculum aims to help develop basic scientific ideas and understanding about the biological and physical aspects of the world, as well as the processes through which they develop this knowledge and understanding. The curriculum also aims to foster positive attitudes toward science, and to encourage examination and appreciation of how science and technology affect their lives and the environment.

The science curriculum is presented in four levels, each of which covers two years of primary school. Level 3, for third and fourth grades, is the relevant level for fourth grade TIMSS participants. Planning at individual school and

a Although junior cycle mathematics will be taught at two levels or tracks, it will be examined at three levels: foundation, ordinary and higher. The foundation level examination will be based on the ordinary level syllabus learning outcomes, but set at an appropriate standard.

classroom levels will indicate what is learned in third and fourth grades, when, and how. The curriculum has a skills section and a content section.

The curriculum aspires to provide students with two key types of skills: working scientifically, and designing and making. A constructivist and collaborative approach is central. The curriculum emphasises the importance of starting with students' own ideas and creating new knowledge and learning about scientific concepts through interactions with objects and materials, and with their classmates. By working scientifically, students learn how to do the following:

- Observe and construct hypotheses;
- Predict;
- Plan and carry out investigations emphasizing fair testing;
- Record and analyze results;
- Share and discuss findings; and
- Extend their thinking to accommodate new findings.

Designing and making involves finding practical solutions to problems by exploring and assessing everyday objects in terms of their functionality, their component materials, their design, and using this information to plan, design, make, and evaluate their own artifacts or models. These activities are intended to harness and nurture students' creative and imaginative capacities.

Curriculum content is composed of four strands: living things, materials, energy and forces, and environmental awareness and care. The strands, which are sub-divided into strand units, outline the concepts and ideas to be explored by students as they work scientifically and are involved in designing and making. Students are expected to experience all Level 3 strand units over the course of third and fourth grades. Exhibit 2 shows the strands and strand units for Level 3, and provides some examples of what students are expected to learn within each strand unit.

Exhibit 2: Summary of the Science Curriculum for Level 3 (Grades 3–4), with Sample Skills

Strand	Strand Unit	Scientific Learning
Living Things	Human Life	Be aware of names and structures of some internal and external body organs, and importance of food for energy and growth; and Understand physical changes in males and females to adulthood.
	Plant and Animal Life	Investigate plants and animals in local environments; be aware of those in wider environments; and Discuss simple food chains.
Energy and Forces	Light	Understand that light is a form of energy, comes from natural and artificial sources, and can be broken into different colors; and Be aware of dangers of looking at the sun.
	Sound	Understand that sound is a form of energy, how it is made, and that it travels through materials; and Identify a variety of sounds in the environment.
	Heat	Understand that the sun is the Earth's most important heat source, and that heat can be transferred; and Know what temperature is, and use a thermometer.
	Magnetism and Electricity	Classify materials as magnetic and non-magnetic, and as conductors and insulators; and Be aware of dangers of electricity.
	Forces	Explore how objects move; are slowed down; and Explore how levers can help lift objects
Materials	Properties and Characteristics	Recognize materials can be solid, liquid, or gaseous; Distinguish between raw and manufactured; Compare and group materials; and Investigate use of materials in construction.
	Materials and Change	Explore effects of heating and cooling on solids, liquids, and gases; and Explore ways to separate materials.
Environmental Awareness and Care	Environmental Awareness	Identify positive aspects of natural and built environments; be aware of interrelationships between living and non-living elements; and Recognize how people's actions affect environments.
	Science and the Environment	Explore application and positive contribution of science and technology to society; and Investigate positive and negative effects of human activities on environments.
	Caring for the Environment	Look at ways for improving local environment; and Nurture a sense of responsibility towards the Earth.

A revised syllabus for Junior Certificate (lower secondary level) science was introduced in September 2003. The course is a practical, investigative one emphasizing hands-on student involvement in learning. Students are expected to develop not only knowledge and understanding of content areas, but also core scientific skills, and an awareness and appreciation of science. Teachers are encouraged to use a variety of teaching methodologies that enable students to work scientifically and apply their scientific knowledge.

The lower secondary science curriculum contains three main syllabus sections, each of which is further divided into three more detailed topic areas, as shown in Exhibit 3. Although not compulsory, approximately 90 percent of lower secondary students take science as a subject. The curriculum provides a suitable preparation, but is not a requirement, for the study of one or more science subjects at the upper secondary level. Topics are accompanied by learning outcomes that reflect an investigative and practical approach. All students must study the three syllabus sections at either the higher or ordinary level.

Exhibit 3: Main Topic Areas for Lower Secondary Level Science Syllabus

Science Subject	Topic Area
Biology	Human Biology—Food, digestion, and associated body systems; Human Biology—The skeletal-muscular system, the senses and human reproduction; and Animals, plants, and micro-organisms.
Chemistry	Classification of substances; Air, oxygen, carbon dioxide, and water; and Atomic structure, reactions, and compounds.
Physics	Force and energy; Heat, light, and sound; and Magnetism, electricity, and electronics.

During lower secondary, students learn to do the following:

- Use scientific knowledge to turn ideas into an investigable form and to plan accordingly;
- Decide the extent and range of data to be collected and the techniques, equipment, and materials to be used;
- Consider factors that need to be taken into account when collecting evidence;

- Make observations and measurements, including the use of data logging where appropriate;
- Critically consider, evaluate, and interpret data; and
- Organize and present information clearly and logically, using appropriate scientific terms and conventions, and using ICT where appropriate.

Many of the objectives of the syllabus are achieved by methodologies that support discovery through investigation. Time is also allowed for active student engagement in learning experiences, to help develop science process skills, better understanding of underlying science concepts, and higher-order skills associated with problem solving and the application of knowledge in new contexts. The syllabus in science provides opportunities for learners to develop thinking and decision-making skills that can be used in problem solving. Such skills can be developed through the systematic approach to investigation, which is a feature of science, and they can be easily transferred to other, non-scientific situations and contexts.

Teachers are encouraged to use a science-technology-society (STS) approach in their science instruction to facilitate student understanding of science and to link learning to everyday contexts and issues. While there is no explicitly prescribed STS content in the syllabus, many of the sub-topics and associated learning outcomes require appropriate links to everyday experiences (in areas such as health, diet, human development, and ecology) and to everyday examples of applications of science (such as in biotechnology, industry, medicine, energy conservation, and electronics).

Appropriate references to the work of prominent scientists and to modern scientific developments provide points of transference from school-based learning to general experience, making scientific phenomena more meaningful for the students.

Instruction for Mathematics and Science in Primary and Lower Secondary Grades

Instructional Materials, Equipment, and Laboratories

No specific instructional materials or textbooks are prescribed for the teaching of mathematics or science at primary or lower secondary levels. At primary school, teachers are provided with guidelines on appropriate materials for mathematicsand science,and publishers are provided with specifications

reiterating the importance of practical work and outlining principles for developing support materials (e.g., visual resources, textbooks, teachers' manuals, and assessment materials).[9, 10]

Teacher guidelines for mathematics at lower secondary, including examples of instructional planning for some topics, have been published to support the revised syllabus introduced in 2000.[11] In practice, teachers base instruction on commercially published textbooks, supplemented by past examination papers. In the case of science, students must complete a minimum of 23 mandatory experiments over a three-year period. As such, schools must have adequate laboratory space, apparatus, and chemicals to facilitate this requirement. While the Department of Education and Skills issues a list of the minimum resources needed to implement the practical work, the list is indicative only. Teachers can also access the National Council for Curriculum and Assessment's ACTION website (http://action.ncca.ie/), which demonstrates features of effective teaching and learning through the use of multimedia and includes some materials that support the teaching of mathematics and science.

Use of Technology

Technology use in fourth grade mathematics and science tends to focus on online interactive resources (games, video, and simulations to present and reinforce concepts). Other technology configurations are in use, such as visualizers and digital media tools, to assist with visualizing and presenting concepts. However, a recent study found that use of technology was a regular feature of only a minority of primary school mathematics lessons.[12] At lower secondary, online interactive resources, digital projectors, laptops, and other configurations such as visualizer and sensor technology are used in science lessons in some schools. Access to high speed broadband and greater access to technology in the classroom, alongside the development of ICT in the mathematics and science curriculum, is significantly influencing and gradually changing how teachers use ICT in the classroom and in their approach to accessing input from science and mathematics expertise online.

The mathematics curriculum provides for the introduction and use of calculators in mathematics from Grade 4 onward, by which time students should have acquired a mastery of basic number facts and a facility in their use. The curriculum highlights how students' understanding of the structure of number can be enhanced with a calculator through exploration of patterns, sequences, and relationships. The curriculum also encourages the use of calculators to

help develop students' problem-solving skills, by allowing them to focus on the structure of a problem and exploring different methods to solve problems. In addition, the curriculum advises teachers to allow calculator use for the purpose of checking estimates, performing long and complex computations, and providing exact results to difficult problems. However, the curriculum stipulates that students need a sound understanding of numbers to make judgments about when it is appropriate to estimate, to calculate mentally, to make a calculation on paper, or to use a calculator for an exact result. Standardized tests for Grade 4 through 6 have specific directions for when a calculator can and cannot be used.

The science curriculum includes general statements on the use of ICT in primary school, noting that students' investigations and explorations can be enhanced through the use of ICT; for example, recording and analyzing information, simulating investigations and tests that support scientific topics, communicating scientific information and findings, working collaboratively on science projects with students in other schools, and in accessing and using a range of scientific and technological information.

Grade at Which Specialist Teachers for Mathematics and Science are Introduced

Primary teachers are non-specialist teachers. Students are assigned specialist teachers for mathematics and science upon entering lower secondary education.

Homework Policies

There is no national homework policy. Almost all primary schools provide students from first to sixth grades with homework on four or five nights per week[13] and some also set a small amount of homework to students in Infant classes. Homework usually serves to consolidate and extend classroom learning. Post-primary schools are urged to develop homework and assessment policies, and there has been significant emphasis on assessment for learning strategies in teacher education in recent years. However, schools have considerable autonomy in such matters and there are no specific guidelines or directives given to schools regarding types or length of homework.

Teachers and Teacher Education

Teacher Education Specific to Mathematics and Science

Teaching in Ireland is an all-graduate profession. Primary teachers complete their initial teacher education either through a concurrent (3-year, full-time

Bachelor of Education degree) or a consecutive (18-month, post-graduate diploma in education) model. It has been proposed that the length of initial teacher education be increased to four years for the concurrent model and two years for the consecutive model. For post-primary teachers, the concurrent route to a teaching qualification is offered for a broad range of programs, typically those with practical, workshop, and laboratory elements. The post-primary consecutive route is a one-year post-graduate professional diploma in education which has been proposed to increase to a minimum of two years.

Prior to the recent publication of revised accreditation criteria for teacher education programs (2011),[14] requirements specific to the teaching of mathematics and science were not set out at any stage of the continuum of teacher education. At the primary level, some teachers will have chosen either mathematics or science as elective subjects for the academic component of their Bachelor of Education degree. However, as the same teacher generally teaches all subjects to their class, all primary school mainstream teachers are teachers of mathematics and science, and both subjects are integral parts of initial teacher education.

At the post-primary level, teachers of mathematics and science are expected to have relevant degrees. The consecutive model of pedagogical training is most common in these disciplines, a degree course followed by a Post-Graduate Diploma in Education. In some universities, a concurrent model is followed, with teaching practice occurring during at least two years of a four-year degree program.

Requirements for Ongoing Professional Development

Although teachers are expected to participate regularly in professional development, doing so is not currently compulsory. From September 2012, all newly-qualified teachers will need to complete a national induction program that will include specific components on the teaching of numeracy and on assessment.

The Professional Development Service for Teachers and the Special Education Support Service are lead agencies for professional development at both primary and post-primary levels. Other sources include a national network of Education Centers and appropriate groups, bodies, and institutions that offer professional development programs from which teachers can select courses appropriate to their needs.

At the primary school level, additional targeted training has been provided to teachers in the implementation of the revised curriculum of 1999, and in Maths Recovery in schools serving students from a socioeconomically deprived background.[15] In recent years, very substantial professional development has supported the new post-primary program, Project Maths, for all post-primary mathematics teachers. T4, the technology subjects support service, currently provides professional development to post-primary teachers of Design and Communications, Graphics, and Technology.

Monitoring Student Progress in Mathematics and Science

Section 22 of the Education Act requires schools "to regularly evaluate students and periodically report the results of the evaluation to the students and their parents." [16] More recent guidelines advise that schools report feedback to parents at least twice annually, including one written report.[17] There is evidence that a significant minority of schools do not provide adequate feedback to parents on a regular basis.[18, 19] At the primary level, school assessment approaches include the use of teacher questioning and observation, conferencing, and student self-assessment. Changes made in 2007 require schools to administer standardized tests in English and mathematics to students at two points: the end of first grade or the start of second grade, and at the end of fourth grade or the start of fifth grade. In practice, annual administration of standardized mathematics tests to all students from first through to sixth grade is almost universal. Individual schools choose their own assessment instruments, with the proviso that standardized tests have been normed for an Irish population and are consistent with the Primary School Curriculum. The *National Strategy to Improve Literacy and Numeracy* (published in 2011) proposes improved reporting to parents and requires that, from 2012, all primary schools report annually to the Department of Education and Skills the aggregated standardized test results of students at three points of the primary school cycle—second, fourth, and sixth grades. There is no intention to publish data from individual schools or to make it possible for the data to be used for the compilation of league tables.

Although Ireland does not operate a national mandatory system of assessment for primary schools, it monitors standards through the regular assessment of reading and mathematics performance of students in a representative sample of schools. Every five years, the Educational Research Centre conducts national assessments of reading and mathematics on behalf of the Department of Education and Skills. The main functions of the national

assessments are to assess national standards, identify factors related to performance on the tests, and inform policy. Almost 8,000 students from second and sixth class took part in the most recent survey in 2009.

At the primary level, classroom tests in mathematics include multiplication table tests, commercially produced mental-arithmetic tests, teacher-designed tests, and problem-solving activities. Classroom assessment tests in science primarily comprise pen-and-paper tests that test content knowledge. Standardized tests are available for mathematics but not for science. At post-primary level, students take teacher-made assessments at the end of most terms. These assessments are generally in written form in mathematics, with some elements of practical work being assessed in science. It is normal for report cards, with grades and teacher comments, to be issued after such assessments. The DES's recently published literacy and numeracy strategy proposes mandatory use of standardized tests in the second year (Grade 8) of post-primary school.[20] At the end of lower secondary school, all students take formal state examinations in mathematics (at higher, ordinary, or foundation level). The almost 90 percent of students who choose science as a subject are also examined, at higher or ordinary level, with 35 percent of the total grade allocated for students' completion of a range of experiments and developing a portfolio of work.

Impact and Use of TIMSS

Ireland has not participated in TIMSS since 1995. There have been no formal studies of the impact of participation in TIMSS, but it is likely that certain changes can be attributed, at least partially, to participation. TIMSS contributed to the thinking behind the current primary school curriculum in mathematics and science, begun in the early 1990s. Possibly as a consequence of Ireland's only average performance on science, science was given a more distinct role in the current primary school curriculum. Also, TIMSS strongly influenced the three most recent national assessments of mathematics conducted at the primary level in Ireland.[21, 22, 23] This influence is apparent in the frameworks used to underpin the assessments, the style of test items, and the range of questionnaires administered. Further, the methodologies used by the IEA in both TIMSS and PIRLS have influenced how statistical analyses were conducted and results reported.

Suggested Readings

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In addition, a range of documents and reports can be accessed on the website of the Department of Education and Skills: http://www.education.ie/servlet/blobservlet/des_publication_listing.htm?language=EN

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