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The OECD Programme on Educational Building (PEB)

The Programme on Educational Building (PEB) operates within the Organisation for Economic Co-operation and Development (OECD). PEB promotes the international exchange of ideas, information, research and experience in all aspects of educational building. The overriding concerns of the programme are to ensure that the maximum educational benefit is obtained from past and future investment in educational buildings and equipment, and that the building stock is planned and managed in the most efficient way.

Sixteen OECD member countries and 11 associate members currently participate in the Programme on Educational Building. A steering committee of representatives from each participating country establishes the annual programme of work and budget.

**PEB Members**
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- Regione Emilia-Romagna (Italy)
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- Republic of Slovenia
- Service général de garantie des infrastructures scolaires subventionnées (Belgium)
- Tokyo Institute of Technology (Japan)

**PEB AND OECD ACTIVITIES**

**ICT AND EDUCATIONAL PROPERTY MANAGEMENT**

A PEB seminar will be held on 1-4 November 2004 in Montreal (Canada) on the theme of how information and communications technology (ICT) can be made an integral part of educational property management; it will be devoted to the infrastructure used for education at all levels. The seminar’s main purpose will be to examine how new technology can make the spaces in which people learn more functional, comfortable and safe and can improve the technical and administrative management of educational facilities.

Faced with a situation in which most school buildings are reaching the end of their initial life cycle and resources have been reduced, educational property managers in OECD countries have more than ever to optimise their operating and investment strategies. This international meeting will examine how the use of ICT can be made an integral part of these strategies by focusing on the following four sub-themes:

- The design or refitting of functional spaces.
- Energy efficiency and user comfort in a sustainable development perspective.
- The safety and protection of facilities.

For each of these fields, a background report will be presented on how ICT has been incorporated into educational property management at the local and national levels in various countries over the past ten years. This will be followed by a review of the solutions that these modern tools make available today. In the course of these presentations, participants will be asked to discuss best practices that have a positive impact on the educational environment as well as the drawbacks, failures, constraints and limitations that they have encountered. Lastly, there
will be a review of how ICT might be developed to meet anticipated needs in the light of ongoing research, current developments, trends and the emergence of new harmonisation standards.

The seminar will be organised jointly by the Quebec Ministry of Education, the Association of Institutional Property Managers (AGPI) and the Quebec Energy Efficiency Agency (AEE).

For further information, contact Isabelle Etienne, OECD/PEB, tel.: 33 (0)1 45 24 92 72, e-mail: isabelle.etienne@oecd.org

CREATING 21ST CENTURY LEARNING ENVIRONMENTS

As this issue of PEB Exchange went to press, the PEB seminar on “Creating 21st Century Learning Environments” was about to take place. The meeting is being hosted by the United Kingdom’s Department for Education and Skills on 26-28 May in London, and is to focus on new and refurbished educational buildings and specialised spaces. Visits to local schools and colleges are scheduled. More information will be available in the journal’s next issue.

EARTHQUAKE SAFETY REPORT

International experts made recommendations to improve the earthquake safety of schools in a report which followed their meeting at the OECD on 9-11 February 2004. Despite the frequent occurrence of earthquakes and the high human and material cost of these disasters, the international community and national governments have not been able to provide reliable earthquake-resistant design, construction and maintenance of school buildings. In response to this need, PEB and GeoHazards International (GHI) convened an “Ad Hoc Experts’ Group Meeting on Earthquake Safety in Schools” to review the problem and propose solutions.

1. A clear statement of the importance of seismic safety in schools and in educational systems, and of the obstacles to improving seismic safety in schools.
2. Recommendations to OECD countries and others, setting forth specific goals to assure seismic safety.
3. A discussion of methodologies and criteria for assessing seismic safety and monitoring progress toward improvements.
4. Suggestions for international strategies and programmes to promote greater safety.
5. Recommendations for OECD actions.

The experts’ report presents a clear and urgent message to governments in OECD and partner countries that issues surrounding earthquake safety of schools can and should be addressed before another disaster occurs. The report summarises the problem as follows:

“The ad hoc Experts’ Group finds it unconscionable that schools built world-wide routinely collapse in earthquakes due to avoidable errors in design and construction, causing predictable, unwarranted, unacceptable and tragic loss of life. Thousands of school children have died because existing knowledge was not applied to make them safe from earthquakes. It is only by chance that there has not been much greater loss of life since many earthquakes have occurred during hours when children were not in collapsed school buildings. Unless immediate actions are taken to address this problem, much greater loss of life of school children and teachers is likely to occur in the future. Currently available technology, mitigation strategies and financial resources can resolve this problem at reasonable cost and in a reasonable time frame.”

The report describes the potential role of the OECD in helping to achieve seismic safety through the use of “long-term efforts sustained by participating nations, and understood and supported by all stakeholders… [t]o encourage the establishment of mandatory programmes of school seismic safety among its member countries…. The OECD should work with member countries and partner countries to help them develop and sustain effective school earthquake safety programmes. [It] should be charged with establishing a procedure for accreditation of national school seismic safety programmes and a means for assessing and validating the status, progress and effectiveness of these programmes.”

The report also establishes principles for mandatory national school seismic safety programmes and describes these major elements of effective programmes:
• Awareness and community participation.
• Seismic safety policy.
• Accountability.
• Risk reduction strategies for both new and existing facilities.
• Effective codes and code enforcement.
• Qualification programmes.
• Education and training in basic school safety.

This report of the experts’ recommendations and further information on this activity are available at www.oecd.org/edu/schoolsafety. The report and the background papers written by the experts will be published in the coming months.

NEW PEB PUBLICATION

PEB has just published a 119-page report entitled Educational Facilities and Risk Management: Natural Disasters. The publication includes ten papers presented at an international seminar on the particular requirements of school buildings in the face of risk of natural disasters, and notably earthquakes. The report not only raises the question of protecting schools physically, it underscores the need to introduce natural disaster response training and education. The publication can be ordered from OECD distributors (see page 27).

MEETING OF EDUCATION MINISTERS

Education ministers from OECD countries met in Dublin, Ireland, on 18-19 March 2004 to debate ways in which they could improve the quality and equity of their education systems. Rapid economic and social change makes this vital to the maintenance of a flourishing economy and society. Under the title “Raising the Quality of Learning for All”, the meeting focused on raising performance levels for all and on improving teacher supply and effectiveness. The event opened with a forum that looked at how education can contribute to social cohesion.

A summary of the meeting by Ireland’s Minister for Education and Science, Noel Dempsey, is available at the Web site www.oecd.org/edumin2004. Under the meeting’s first theme, Raising Performance Levels for All, Minister Dempsey relates that the leaders were asked to reflect on “fostering learning environments and models of school governance that are conducive to innovation, and allocating human and financial resources in ways that enhance an equitable distribution of learning opportunities.” Ministers expressed agreement over “the importance of international collaboration in defining and monitoring educational quality.” One minister “raised the question of how education policy can raise standards in poorly performing schools, including through differential resource allocation. He underlined the importance of complement evaluation and assessment with well-targeted support structures for under-performing schools, and encouraging schools to assume greater responsibility in devolved structures of decision-making.” Ministers “noted that greater autonomy at school level would need to be complemented with adequate support and management by educational authorities.”

The meeting’s second theme related to the influence of teachers on what students learn, on their attitudes to learning and on their skills and motivation for lifelong learning. In most countries, teaching is an ageing profession, and OECD countries are experiencing problems in recruiting and retaining effective teachers.

At the forum on social cohesion, ministers were joined by members of the press and non-governmental organisations. Common problems were identified and solutions suggested, such as these:

• “Teaching values and personal responsibility raises particular challenges, not least because it immediately raises the issue of how those values can be conveyed to teachers and also because values must not only be taught, but also experienced in the school context.”
• “Practical on-the-ground understanding of the local community and the environment can be effective in engaging young people in local concerns and issues.”
PORTUGAL PROMOTES ART AND SCHOOL HERITAGE

The Portuguese Ministry of Education is giving emphasis to two national programmes that promote art in schools and promote the country’s cultural heritage through school architecture. In November 2003, the ministry published full-colour books, entitled *Aesthetic Enrichment of the School Environment* and *Portuguese School Heritage*, presenting results of the two programmes.

**Aesthetic Enrichment of the School Environment**

Since 1991, the Ministry of Education has been sponsoring a programme on the artistic-teaching environment for primary, middle and secondary schools through the Aesthetic Enrichment of the School Environment Competition. The programme aims to encourage appreciation of the arts and to contribute to enhancing the aesthetic environment in schools.

The programme is based on providing quality education through initiatives which reinforce the values of the Portuguese cultural identity and help create a school environment that inspires learning. In this way, children and young people receive an all-round education that includes human, community, environmental and artistic values.

For the competition, schools submit art projects including painting, sculpture and ceramic tiles, for installation both within the school buildings and outside. A jury of artists and architects select projects on the basis of their aesthetic quality, originality, subject and integration into the school environment. Each year, the Ministry of Education finances the execution of the projects chosen by the jury.

The competition is open to projects designed by one of three methods:
- by teachers with the participation of pupils;
- by pupils under the guidance of teachers;
- by artists.

While the ultimate objective of these three methods is to visually enrich and humanise the school environment, the methodology and strategies adopted to achieve this differ. In the first two cases, the emphasis is on aesthetic experience through personal involvement in its creation. Pupils and teachers, during lessons or in extra-curricular activities, design, develop and sometimes realise works of art based on subjects which they consider relevant to perpetuating cultural symbols or which are more universal in nature. These works can then be used as educational supports to stimulate communication between those involved, cutting across disciplines through activities which blur the boundaries between different subjects, both within the curriculum and outside it, and building bridges between the school and its surroundings.

In the third case, the school commissions a recognised artist, adding a more significant work of art to the school environment. Such works have consisted of sculptures in stone or bronze, paintings on canvas or wood, tiled or carved stone panels and more wide-ranging schemes combining painting, sculpture and architecture.

Although the third method does not emphasise direct pupil and teacher participation, the involvement of an
external actor – the artist – has proven to be a positive factor in the dynamic of teaching institutions. The link between the artist and the school provides an educational opportunity for promoting culture and developing curiosity and interest in the art work and in the phenomenon of artistic creation.

The book Valorização Estética dos Espaços Educativos highlights over 40 art works installed at Portuguese schools. The potential of this programme is illustrated by the considerable participation of schools in the competition, the positive impact of the artistic activities on pupils and teachers and, not least importantly, the quality of the art works which have helped to make Portuguese schools more attractive, pleasant and aesthetically enriched.

Portuguese School Heritage

From 1977 to 2003, the Ministry of Education carried out a Programme for the Preservation and Safeguard of the Portuguese School Heritage. The programme provided funding to municipalities so they could restore, preserve and upgrade primary and middle schools considered of historical interest, particularly buildings built before 1955. Under the programme, applications were submitted annually to a jury appointed by the Ministry of Education. By 2002, over 220 applications had been submitted.

The ministry decided to publish a selection of the completed works adjudged excellent by the competition jury. The publication Património Escolar Português features dilapidated buildings that were transformed into efficient and comfortable schools, while upholding the architectural values which make them local landmarks and part of the cultural heritage.

The two publications are available in Portuguese from the Ministry of Education. Contact:

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UIA SEMINAR

The International Union of Architects (UIA) and UNESCO, in collaboration with the Chilean College of Architects and Ministry of Education, organised the 16th International Seminar of the UIA Work Programme on Educational and Cultural Spaces in November 2003, in Santiago, Chile.

The seminar focused on “Architecture for Education of the Future”. Two hundred and forty delegates from 20 countries analysed the challenges of providing spaces that contribute to quality education and discussed new architectural solutions. The participants considered possible scenarios of the information society and the processes of globalisation which force architects to rethink their projects and design strategies. Discussion centred on the role of the educational environment in the context of today’s changing social dynamic; the overriding conviction was to consider the needs of the present in designing tomorrow’s educational and cultural spaces.

For more information, contact Jadille Baza, Coordinator, Organising Committee, e-mail: jbaza@mineduc.cl

INFRASTRUCTURE CONGRESS IN MEXICO

In November 2003, Mexico organised its 2nd Infrastructure Congress to examine current work related to educational spaces, both national and international, giving special attention to disaster safety. The event, held in Cancun, was organised by the Administrative Committee for the Federal Programme of School Construction (CAPFCE).

The 2nd Infrastructure Congress examined work in various areas of educational building in Mexico. The State of Chiapas is developing a project to convert old bus chassis into mobile classrooms in order to reach rural areas where access to education is a problem. Veracruz University recently constructed a library and information building designed as an innovative example of providing extensive multimedia and printing facilities. Also presented were the refurbishing project of the Carolinian Building in Puebla, an “Adopt a Classroom” project based on private sponsorship and newly developed techniques involving the use of prefabricated classrooms.

One important concern of the meeting was to maximise safety and security measures for school infrastructure, considering that most school buildings today are intended for use as shelters in the event of a natural disaster. A case study of the new university buildings in Colima which collapsed during Mexico’s January 2003 earthquake was presented, as well as preventive and reactive disaster emergency mechanisms.

Other countries shared their recent practices, such as Italy’s Intelligent School in Milan which maximises energy efficiency through a variety of conservation methods.

The Regional Education Design Competition, sponsored by CAPFCE, took place in conjunction with the congress. The competition was open to students from public and private universities in four Mexican states. Three grand prizes were awarded, and the first prize winning design is scheduled for construction this year.

Together with international experts, the congress’s 250 participants represented universities and technology institutes, state education secretariats, federal agencies, the private sector and the general public.

CAPFCE is the federal government body responsible for school building. Its policy is to promote educational community centres by improving knowledge and providing solutions for safe and secure facilities, through interaction with the local community and with respect for the environment. CAPFCE will hold a 3rd Infrastructure Congress on 20-22 October (see page 28).

For further information, contact Jaime G. de la Garza, Advisor for the Undersecretary of Planning and Coordination, Secretariat of Public Education (SEP), Mexico City, Mexico, fax: 52 55 53 29 69 31, e-mail: jggr1@alterrea.com
EDUCATIONAL INFRASTRUCTURE AND THE OPEN SCHOOL

The Greek School Building Organisation (OSK) organised, with the participation of the Greek Ministry for Education and Religious Affairs, a conference entitled “The Open School”, held in Athens on 26 February 2004. The participants included representatives of PEB, UNESCO and the Working Body on Cultural and Education Spaces of the International Union of Architects.

The main purpose of the conference was to address the following issues and themes:

• The school as a centre of social activities and the educational and social challenges that this poses.
• The spatial characteristics of the open school and the architectural changes stemming from its emergence.
• Schools and public space.
• The open school and policy measures that promote it.

National case studies illustrating the situation in specific countries were presented. A variety of original options for promoting the future provision of various community services integrated into educational facilities were discussed. And the open school was described as being a powerful factor for social cohesion.

For further information, contact Isabelle Etienne, OECD/PEB, tel.: 33 (0)1 45 24 92 72, e-mail: isabelle.etienne@oecd.org

AN ASSET MANAGEMENT METHODOLOGY FOR QUEBEC

An innovative asset management methodology developed in Quebec based on a normalised asset inventory allows managers to establish the “health” of their building portfolios. The SARRA system uses asset prototypes to encapsulate life cycle cost data such as replacement costs and preventive maintenance tasks.

This methodology assists managers in making optimal decisions concerning capital investments and presents a film on the evolution of the portfolio rather than the traditional condition “snapshot”. With this approach, it is possible to accurately establish life-cycle costs for up to 25 years.

By using normalised asset inventories and performance indicators, it is possible to establish the common

ARCHITECTURE PRIZE

School Complex Wateringse Veld in The Hague

The 2003 international Best Architecture for Education prize was awarded at the “5th Buenos Aires International Forum of Educational Architecture” which was held in Argentina’s capital last November. The prize is supported by UNESCO.

The First Place award went to the School Complex Wateringse Veld in The Hague, Netherlands. The Colegio Northlands in Nordelta, Argentina, took the 1st Honourable Mention, and the 2nd Honourable Mention went to the Atidim Secondary School in Or Akiva, Israel.

Evaluating Montbrillant Lower Secondary School in Switzerland

Does Geneva’s Montbrillant lower secondary school, which has now been in use for one year, meet the objectives targeted when it was designed? Does the new school respond to the needs and expectations of staff and students? Questions such as these serve to evaluate the quality of a school building once in use and tie in with work supported by PEB on post-occupancy evaluation. For the design of Montbrillant, the Geneva authorities promoted specific integrated concepts; to verify to what extent these were successfully incorporated into the building, the author contacted the school’s users, i.e. its management, administrative and technical staff, teachers, and students. Although their overall appreciation was positive, the users expressed dissatisfaction with many aspects of the facilities as described below.

The Montbrillant lower secondary school project was presented in the October 1998 issue of this journal after an open architectural competition had been completed. What was only a project six years ago became a reality between September 2000 and June 2003 and is now an attractive working facility. In Geneva, lower secondary schools teach the “orientation cycle” combining the last three levels of compulsory schooling; each of these schools has approximately 700 pupils aged 12-15.

The new Montbrillant school serves an inner-city area of Geneva, with all that that implies: single-parent families, ethnic minorities, crime, drugs, prostitution, and a rundown urban environment with few sports and recreational facilities. Damage, graffiti and theft are part of the package in inner-city areas, and much advice and guidance has been published by PEB over the years. If school buildings are not to become fortresses, then the solutions need to be human and social.

The main objectives of the Montbrillant project were to:

- Ensure high-quality social participation not only for pupils and staff but for members of the outside community.
- Group activities in specific areas and optimise public access outside school hours.
- Give the project a general artistic concept that enhances the atmosphere within the school.
- Provide green areas on the school site and use outside areas for educational and recreational purposes.
- Construct an adaptable, flexible building for the long term.
- Ensure that the school can adapt to changes in educational practices and information technology.
- Create a supportive and healthy environment in a school that is easy and economical to run.

The winning solution is massive but compact, with a large amount of accommodation partly or fully underground and the outdoor sports facilities on the roof. This results in minimising the building’s footprint and freeing the maximum amount of land at ground level for public open space. Internal courts and social areas provide a private realm for the school.

Social participation: common areas

The common areas, whether they are furnished areas or atriums, allow there to be social participation at Montbrillant lower secondary school outside class hours.
Pupils readily use the common areas, although they regret that, because of the need for order and supervision, teachers and administrators do not allow them to use these areas during extended breaks and class periods. As the areas are uniformly distributed over all sectors and floors, this “decentralised” arrangement does not allow the teaching staff to supervise pupils effectively.

The benches and tables available are much appreciated by pupils, who use them to study between classes or simply to socialise.

The large atriums are also greatly appreciated by pupils, as they are spacious and well-lit and give a sense of freedom. However, teachers have reservations about these atriums, which they feel are dangerous in that pupils have been known to throw objects from the upper levels.

**Grouping of activities by sector and public access**

The objective of grouping similar activities in specific areas is aimed at improving the internal functioning of the school and creating areas with specific characteristics. Similar courses are grouped in these areas, together with their fixed and movable equipment.

Sports areas and the auditorium, for example, are accessible to external users outside the school’s opening hours, with proper control of entrances and connecting areas.

Pupils congregate in the sector of classrooms without computer and laboratory facilities on the lower levels, for these teaching areas account for 80 to 90% of educational activities. The teaching areas on the upper floors, which are devoted to more specific uses, are proportionally underused, as are their adjacent outside areas.

The media library, according to the administrative staff, should have been located one level lower so as to be closer to the administration and entrances.

**Artistic concept**

The building has been studied from an artistic standpoint. The bright colours of the interior contrast sharply with the sober and discrete outer façades. Users have had mixed reactions to the artistic concept.

The decision to restrict the use of white to the playground area located on the lowest level of the entrance porch was the guiding theme for the interior decoration conceived by the Basel designer Renée Lévy. It was even necessary to negotiate so that white “blackboards” and projection screens could be used in teaching areas.

Dozens of different hues and colours are found in all the areas inside the school, alternating between red, satin blue and plain concrete on the walls to flocked orange and platinum grey on the floors.

Pupils as well as teachers and administrative staff are bothered by this concept of an untouchable work of art. Pupils feel deprived of the right to use the school’s walls, especially to post their artwork, while the administrative staff feel that it seriously limits their ability to post internal notices and signs.

Despite this, users admit somewhat paradoxically that they prefer this brightly coloured interior to the white or beige walls of their previous schools.

Surprisingly, the red colour used in the corridors, which adults find too bright, does not bother the pupils, who object more to the fluorescent yellow used in the auditorium and physical education rooms. The more neutral colours (blue and grey) are not mentioned in their evaluation.

The pupils also mention the fact that the colours lack any practical meaning. The continual use of red in all connecting areas, on all levels and in all sectors of the building makes it difficult for them to find their bearings and distinguish one area from another.
As regards the long-term maintenance of the interior of the building, this integrated design could act as a constraint concerning any future changes.

**Outdoor areas**

*Sports area on the roof*

All outdoor sports facilities, usually located on adjacent land, have been placed on the roof, which has an area of 5 000 m², in order to allow the surrounding land to be used for green and recreational areas.

The use of the roof as a sports facility, a well-established option in urban areas, has raised problems, mainly involving safety, that should be easily solved. Any balls that go over the protective fence become dangerous and can injure people in the courtyard and public areas below. In addition, unruly pupils have occasionally thrown the gravel along the edge of the basketball courts from the roof. Access to the roof has temporarily been closed pending a solution to these problems.

Pupils appreciate this facility and are sorry that they can no longer use it during recreation periods.

**Outside architecture and site**

The pupils find the outside architecture of the school severe and cold. Its straight lines, naked concrete and predominant use of glass and lack of colours give the impression of a school designed for adults, such as a university. The school’s monumental entrance also adds to this impression.

The large sunken area 30 x 15 meters and 10 meters deep, known as the “flying carpet” designed by the artist near the entrance, is not appreciated by pupils. They wonder what purpose it serves. The boys would like to use it as a football pitch and the girls would like it as a volley-ball area to use during recreation.
The ping-pong tables located outside are a great success. They are used continuously by pupils and have become the main focus of the courtyard, which is an area for socialising.

Because of the building’s position and the sloping terrain, there are two distinct courtyard areas. This division into two courtyards bothers users. They are probably used to the frequent model of a single courtyard surrounded by the wings of the building.

**Limited parking space**

One of the specific characteristics of this school, located near the main train station, is that it does not provide parking for staff. The cantonal and municipal authorities want to limit traffic in the city centre by promoting the use of public transport.

The small number of parking places – only 11 – poses a problem for the school’s management, which does not know what criteria to use in assigning them.

**Rapid deterioration of the building**

After a few months’ use, the building had undergone various types of damage: some 60 slat window shades had been broken on the ground floor, the façades and street furniture had been covered with graffiti, the school had been broken into and equipment had been stolen. Since there is free access to the school outside class hours, it is impossible to monitor it permanently.

**A flexible building: site utilities and electricity networks**

The site utilities and electricity networks were designed so that they could undergo the inevitable future changes in use. Utilities are grouped in vertical ducts incorporated into the load-bearing walls and are accessible through removable panels. The electricity network is distributed through smaller ducts that house both high and low voltage lines, including those for light controls.

**Users’ appreciation**

Despite the shortcomings that have been discovered with use and that have been pointed out by users, the general functioning of the school has not been called into question, and all the pupils and staff recognise the high quality of the building.

There is unanimous approval of the internal space and luminosity of the school, as well as of the large number of activities offered and the increasing number of computer and communications facilities available in the media library and computer classes.

**New projects for tomorrow**

Two new architectural competitions that have been held for buildings with the same surface area have resulted in the selection of two completely different projects on two very different sites. In one case, the lower secondary school will be divided into three separate buildings. In the other, the entire school will be contained in a single building with a ground floor and first floor. The operational problems pointed out above will be taken into account and will lead to other solutions in these future buildings (for example, interior atriums will be eliminated or will only be two levels high, and there will only be one outside courtyard). Involving users in the design of one of these projects (where an existing school will be rebuilt) should also be effective in ensuring that the facilities meet the educational needs.

**Technical description of the building**

| Total floor area: | 17 700 m² |
| Building volume:  | 85 000 m³ |
| Construction cost:| CHF 52 million |
| Construction time:| 34 months, from September 2000 to June 2003 |

For more information, contact:

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SCIENCE AND TECHNOLOGY FACILITIES

At the recent meetings of the OECD Committee for Scientific and Technical Policy and of the Education Committee at ministerial level, ministers endorsed reinforcing the capability to make science and technology more appealing and attractive from the early stages of education as a means of increasing human resources in these areas.

These four articles relate to science and technology infrastructure for secondary and tertiary institutions. The first article presents a view on approaches to teaching science in school and illustrates ideal science facilities for secondary education. The second piece reports on work underway to improve the Science Complex at the Université du Québec à Montréal. The third describes a secondary level vocational training centre devoted to new technologies in Quebec. The fourth article visits an Australian science and mathematics specialist school.

Science-teaching areas: from educational approaches to appropriate facilities

Education and the “Missions Decree”

On 24 July 1997, a decree was issued defining for the French Community of Belgium the priority missions of primary and secondary education (the compulsory levels of education in Belgium, covering ages 6-18). In Articles 16, 25 and 35 of the decree, the government defined the basic skills to be taught and gave them force of law. University teachers, specialists in the field of education, inspectors and teachers in the three education networks that co-exist in Belgium (the French, German-speaking and Flemish Communities) worked together to prepare this legislation which covers general, technical and vocational education. Certification will attest that schools teach basic skills effectively. The programmes are “frames of reference for learning situations, compulsory and optional curricula and methodological approaches defined by the relevant authorities to ensure that the targeted skills are attained”.

It then remained to define the methodologies to be used to achieve these unanimously established objectives. Each network supported, in its programmes and methodologies, an approach that would encourage pupils to become active participants in the learning process and to acquire standardised scientific knowledge. The teacher guides this process, becoming more a facilitator of active learning than a dispenser of knowledge.

Activities are placed within a context and are more holistic in order to make them meaningful. With regard to our specific topic of the sciences, scientific education is organised around three subjects: biology, chemistry and physics. The methodological objective is to:

- Foster a more dynamic learning relationship between teachers and pupils.
- Build bridges between the concepts and approaches learnt in biology, chemistry and physics.
- Save time and gain in consistency by teaching scientific approaches common to the three fields.
- Involve teachers more actively by giving them greater flexibility in implementing the programme.

According to one programme, pupils are enabled to master skills when they are encouraged to become “active learners”. It is this concept of active learning that has been predominant in primary education that must now be adapted to the secondary level. Six converging pathways will be used to reach this goal: comparing perceptions...
with established theories, modelling, experimenting, mastering knowledge, building a rational argument and communicating.

In any event, this approach will require that in any scientific practice, pupils show intellectual honesty, a balance between open-mindedness and scepticism, curiosity, and willingness to work within a team – seemingly indispensable qualities.

All science programmes present experimentation not only as a “verification” process but as a means of assimilating models, laws and theories. The use of simple material should be encouraged. Some experiments might also provide an opportunity for genuine research and others for exploration in the field.

One of the key objectives of education is linked to communication. Through the education process, pupils come to understand the benefits of acquiring a language, concepts and standardised models as well as a degree of socialisation to which science courses should also contribute.

One of the programmes visited by the author prefaced its presentation with a quotation by Albert Einstein, which is particularly relevant to the approach promoted here: “A young mind must not be crammed with facts, names and formulas. These can be learned without taking courses, since they can be found in books. Education should concentrate solely on teaching young people how to think, on giving them this training that no manual can replace.”

We also think that if science is being taught in a traditional lecture class format, there is no need for a laboratory – any ordinary classroom will do. According to the dictionary, a laboratory is a facility equipped for performing experiments, conducting research and making scientific preparations. The word’s Latin origin, laborare, means “to work”. This underscores the active dimension that should be an integral part of laboratory work.

All of the comments above, which clearly reflect a definite educational philosophy, have not been selected at random. They express a fundamental truth, which also applies to the educational building sector as a whole. Buildings are genuine educational tools. When well designed, they unquestionably help promote original participatory approaches to achieving the sought-after objectives. On the other hand, buildings can be a major handicap if they make it difficult to develop attitudes and material and intellectual approaches aimed at understanding the laws that govern the physical and organic world.

We can readily agree that a place of learning that requires rigour, method and concentration cannot tolerate a disorderly approach on the part of its occupants or in its facilities. What we would like to see are specialised spaces assembled according to needs and resources on the basis of a concerted plan for their use, making school buildings places where pupils can learn through experience, observation, reasoning and research, share their successes and failures, and communicate with the outside world through computer-based tools.

We must bear in mind that this approach, although it enjoys wide support, is seldom put into practice, for it is too different from the traditional approach that has prevailed in secondary education. It is new kinds of behaviour that we need to invent, experiment with and evaluate by dint of our efforts and creativity and the support of various authorities that participate in the work of education.

We do not claim to be developing a new methodology for learning the sciences. As G. de Landsheere wisely said about other educational reforms, there can be no objection to individual schools adopting a method that simply reflects a universal approach to teaching scientific knowledge, but that is also fuelled by the contributions of all concerned, both teachers and learners, by the potential of learning sites inside and outside the school and by partnerships with local actors that will often be motivating to pupils (such as factories, SMEs, national defence and airports).
Facilities

We wanted to illustrate, in partnership with an architectural firm, the various components that a science-teaching area should have in a secondary institution having approximately 1 000 pupils. Ideally, a science-teaching area should consist of the following facilities:

1. Chemistry laboratory.
2. Physics laboratory.
3. Natural science laboratory.
4. Laboratory for geography, environmental studies, ecology, etc.
5. Preparation area.
6. Dedicated room for project-based research (accommodating 4 x 5 pupils).
7. “Museum” area for the school’s science collection.
8. Auditorium for conferences and outside courses (guest teachers, preparation for higher education).
9. Informal meeting area.

In these facilities, strong emphasis would be placed on safety and effective ventilation of any toxic fumes in the event of an accident.

Special attention would be given to acoustics and sound-proofing, so that small teams working on a specific project could move from one area to another.

The diagrams presented above are deliberately of a non-architectural nature, and are aimed only at giving an idea of the spaces involved. They show alternatives that can be reproduced in an infinite variety of ways depending on the available space in new or renovated buildings. We have estimated the cost per square meter at approximately EUR 1 000, not including tax, both for newly constructed and renovated buildings, depending on the techniques involved.

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The Science Complex at the Université du Québec à Montréal

The Université du Québec à Montréal (University of Quebec at Montreal, UQAM) is carrying out two major projects to improve its Science Complex. UQAM is constructing a biological sciences building and is renovating four existing buildings as part of the “Cœur des sciences” project (“Heart of the Sciences”). These projects are being carried out using an accelerated method under the responsibility of a construction manager and are aimed at contributing to the development of Montreal. The new building will be a “green building”.

The Science Complex, also known as the West Campus, houses the Faculty of Sciences, one of UQAM’s seven faculties. The complex currently consists of seven buildings located in the centre of the city of Montreal, near the university’s central campus. UQAM, with its 40 000 students, is the main branch of the University of Quebec. UQAM is celebrating its 35th anniversary this year.

The Biological Sciences Building

The construction of the Biological Sciences Building is essential for the future of sciences at UQAM, since the Biological Sciences Department is a key actor in the field of the environment, biochemistry and biotechnologies. It is the university’s response to the need to promote and accelerate the development of a specialised labour force in biotechnology in Montreal, which is a major centre in this field.

The Biological Sciences Department is currently located in an outdated building in the city centre. Moving the department to the Science Complex is designed to improve working and learning conditions for its staff and
students and promote higher quality and more coherent departmental and interdisciplinary relations between the units of the complex.

The new building will have a total gross floor area of 42,000 m², of which 17,500 m² will be for the department and 9,000 m² for rentable space. The building will also include an underground car park with 450 places. This building will be spiral in shape and at its highest will be 11 storeys. The part devoted specifically to academic activities will be spread over five floors. Its total cost is estimated at CAD 75.5 million and it is scheduled to open in September 2005.

The construction of the Biological Sciences Building has been registered with the U.S. Green Building Council in order to obtain LEED certification (Leadership in Energy and Environmental Design). Since the project’s inception, UQAM has targeted the objective of including the largest possible number of criteria defined in the LEED specifications used for accrediting “green buildings”. For example, special attention is being given to the building’s location and rainwater management. The building’s design is aimed at optimising inside air quality and the energy performance of the building envelope and air processing systems.

The “Heart of the Sciences” area

Within the complex, the “Heart of the Sciences” area is intended to be a permanent, multi-purpose site for disseminating scientific discoveries and breakthroughs. Promoting scientific activities and holding events will also be given an important role. This area will be focused particularly on providing young people with information and promoting their interest in science and scientific careers. The main goal is to make the “Heart of the Sciences” area rapidly become the major centre in the field of science and technology in Quebec. More specifically, the project will include the following facilities: a science forum, a media library, a 350-seat auditorium and a 450 m² multi-purpose room. The renovation of the auditorium, combined with the classrooms available in this building, will make it possible to hold conventions.

Within the “Heart of the Sciences” area, four old buildings located on the site will be preserved and renovated. These buildings once housed the École technique de Montréal (Technical School of Montreal), and each one was dedicated either to practical, industrial activities or theoretical aspects. This duality in the treatment of the buildings, which highlighted the specific nature of each of its parts, confers an architectural and historical interest on this group of buildings. The university thought that this historical heritage had to be preserved.

The project also entails relocating the science library to the “Heart of the Sciences” area, thereby freeing up some 3,000 m² of floor area in the President Kennedy Building, which houses the Departments of Earth and Atmosphere Sciences, Mathematics and Computer Sciences and the Institute of Environmental Sciences.

The budget for this project is CAD 20 million.

1. These buildings are the auditorium located in the Sherbrooke Building, the Boiler Room Building, the Old Forge and the Kimberley Wing.
Accelerated construction method

In order to meet the project’s completion date set for mid-August 2005, UQAM has implemented an accelerated construction procedure. This means that construction can start while work on plans and specifications is still under way. This will involve dividing the construction into separate work items and sub-items to be carried out successively or simultaneously, thereby reducing the duration of work by one year. A process of competitive bidding for each work item will make it possible to comply with the same rules of transparency and competition as when bids are submitted as a single item.

The accelerated construction process requires awarding a contract to a different contractor for each item or sub-item. It is currently estimated that there will be a maximum of 50 items and sub-items, for a total amount of CAD 95.5 million (CAD 75.5 million for the Biological Sciences Building and CAD 20 million for the “Heart of the Sciences” project).

Construction manager

In order to effectively co-ordinate this process in which plans and specifications will be issued while construction is under way, UQAM has hired a construction manager as a member of its team of professionals, who was selected through a competitive bidding process. Under the university’s authority, the construction manager is responsible for co-ordinating contractors and ensuring that the costs of each work item and sub-item stay on budget (prior review of calls for tenders and strict monitoring of each stage of construction) and that work deadlines are met. He will participate actively in meetings with architects and contractors to make recommendations regarding materials, construction methods and fittings in order to reach optimum solutions that are economical and best adapted to the project. Also, he will be responsible, in co-operation with other professionals, for analysing the results of calls for tender. As UQAM’s legal representative, he will sign and manage the contracts with the various contractors.

Integration into the city

UQAM will contribute to the urban development of the district in which the Science Complex is located. In accordance with the city’s master plan, the block on which the Biological Science Building is to be located, which has long been used as an outdoor car park, will now have a building on it. Parking will be moved to underground levels, and this new building located on a major artery going into the city centre, rue Saint-Urbain, will give the area a more urban aspect. The overall plan will give the campus a higher profile within the city. A north-south road going through the centre of the site can still be used by cars in an emergency and provides a visual axis, but it will mainly be used as a pedestrian street. There is also access from east to west through the campus, which forms a vast external courtyard encircling the old buildings being restored.

The area north of the new building will remain vacant for the time being, pending construction of future university residences. The objective is to build residential areas for students that can be rented at a reduced rate in summer, thereby contributing to the mix of population groups, as targeted in the city’s master plan.

Underground and above ground pedestrian networks are planned. The underground network will interconnect UQAM’s various buildings and provide direct access to the Place-des-Arts metro station. However, the above ground network will be designed to provide a pathway system that will encourage users to walk between the different buildings as well as between the neighbouring streets, thus maintaining the traditional model of a campus crisscrossed by numerous footpaths.

Special care has been taken to minimise the impact of construction work on neighbours. An historic building, the church of Saint-John-the-Evangelist, is located next to the future Biological Sciences Building, and precautionary measures have been taken to protect it, particularly when the piles are being driven.

A short 3-D visit to both projects and a visual presentation of the model of the Biological Sciences Building are available on the site complexedessciences.uqam.ca

Information on UQAM is available at www.uqam.ca

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INVITATION TO VISIT THE SCIENCE COMPLEX

Individuals who register for the PEB seminar to be held in Montreal in November 2004 (see page 2) will be able to visit the Science Complex and see in person the entire complex and the progress of work on the Biological Science Building and the “Heart of the Sciences” area.
A secondary level vocational training centre devoted especially to new technologies has been established in Quebec. The Centre de formation des Nouvelles-Technologies (New Technologies Training Centre, CFNT) provides an environment that is in close contact with the reality of the labour market in the way it was designed, its training programmes and its international accreditation.

The three-storey building reflects an educational and functional concept in which space is organised horizontally in two parallel wings separated by an atrium acting as a meeting area and connected by two walkways. Each wing of the building houses a vocational training sector. The sectors arranged in a linear layout converge on the meeting area, which has glass walls on two sides that maximise natural light.

The CFNT’s vocational training programmes consist of alternating training periods in class and traineeship periods in the workplace. This feature, combined with a dynamic environment, enables CFNT pupils to study in a setting that prepares them for the world of work.

The centre is part of a worldwide network recognised for its expertise and competence in the fields of computer-assisted design, computer science, office automation and network infrastructure equipment. Through its association with partners of international standing, the CFNT ensures that it is at the cutting edge of new developments. The CFNT has also distinguished itself by winning the “Americas Award” presented by Autodesk, Inc., a first for an exclusively French-speaking training centre.

This project has made it possible to bring together at a single site training activities that were previously scattered across a number of sites. Located at the heart of a rapidly expanding educational crossroads only 30 minutes north of Montreal, the CFNT opened in August 2002. Primarily funded by the Quebec Ministry of Education, this building, which cost CAD 8 million and has a floor area of 6,800 m², was built by the School Board of Seigneurie-des-Mille-Îles.

For further information, consult the centre’s Internet site, www.cfnt.qc.ca, or contact:
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At the cutting edge of maths and science

Geoff Maslen visits an Australian science and maths specialist school where academics are working with teachers to ensure that what they teach is at the frontier of learning. This article, which appeared in the Times Educational Supplement ePaper on 23 March 2004, concerns the ASMS school presented in PEB Exchange no. 46, June 2002.
Nigel Hancock travels almost 2 000 miles to go to school. For his friend Ray Dolan the distance is only 700 miles but both boys would not want to be educated anywhere else than at the Australian Science and Mathematics School (ASMS).

The two 17-year-olds heard about the unique school, located in the spacious grounds of Adelaide’s Flinders University, before it opened early last year and applied to enrol. Nigel Hancock had dropped out of high school in his home town of Katherine in the Northern Territory while Ray Dolan was attending Cobar High School in the far west of New South Wales.

“I’d heard how it was going to be more university-based, with more lectures and we wouldn’t be working out of textbooks,” Ray Dolan says. “I thought that was really good ‘cos I hate textbooks... everything they were saying matched up with what I always wanted in a school.”

Nigel Hancock nods agreement: “This school offered me the chance to re-enter the education system. I thought it would encourage different ways of learning, that it would cater for kids who didn’t fit into the formal classroom – which was me down to a T.”

At ASMS, students devise their own learning plans and decide what level of difficulty to work at, and teachers use more varied methods than in traditional schools. In a unit on communications systems, for instance, pupils might have a lecture from a teacher on the principles of electrical circuits, go to the laboratory to carry out group experiments to develop understanding and report back to the entire group by creating a multimedia presentation.

Nigel and Ray are among 265 teenagers and 25 teachers occupying the AUD 14 million, two-storey ASMS building on the university campus. By 2005, student numbers will have grown to 450, of whom 100 will be young people from other parts of the world. By that time, they both expect to be studying for degrees at the university. In an Australian – and possibly a world – first, Flinders established the specialist school as a joint venture with the state Education Department.

In part, it is intended to counter the 50% decline over the past 20 years in the number of young Australians studying physics and chemistry. ASMS pupils are not selected on IQ or high performance in maths and science, but on the basis of showing a strong interest in the subjects.

With its plans to have students spend time in different workplaces as part of their studies, the school should also create new relationships between teachers, students, scientists, mathematicians, business, industry and the local community. For instance, at the university pupils take more demanding modules delivered jointly by teachers and academics.

Core studies at ASMS include sustainable futures, technological world, energy, food and materials, the human body, biotechnology, nanotechnology, communication systems, the earth and the cosmos, mathematics and abstract thinking.

ASMS is typical of one of the models of future schools presented by the OECD at the Dublin conference (see page 4), in which schools become organisations where staff research and the involvement of professionals from other walks of life, in this case academics, constantly updates teachers’ knowledge and professional development.

Academics are already working with ASMS teachers in developing the inter-disciplinary curriculum. Their expertise ensures what is being taught is at the frontier of learning, says John Rice, former director of the Flinders Institute for Research in Science and Technology.

Professor Rice proposed establishing such a school in 1998 and later worked with the present principal, Jim Davies, in developing the idea and negotiating the joint operation with university and department officials. “We wanted a school where there was a commitment to take account of the technological revolution and its impact in mathematics and science,” he says.

Jim Davies says the architect-designed, open-plan building accords with this goal. Within the nine major learning areas, students have their own desks and computers alongside their teachers who do not have a staffroom to escape to.

Facilities include laboratories, a fully-equipped multimedia centre and a student recreation area as well as access to the university's libraries, sports grounds and gymnasium.

“Each student has his or her own learning plan and a tutor,” Davies says. “But the school is also a resource for every teacher in the state through our programme of professional development and curriculum enhancement.”
LOW ENERGY SCHOOLS IN IRELAND

Out of a commitment to reducing carbon dioxide emissions, Ireland’s Department of Education and Science has designed and constructed two low energy schools, in Tullamore, County Offaly, and Raheen, County Laois. With energy use in buildings responsible for approximately 55% of the CO₂ released into the atmosphere and a major contributor to global warming, the Department researched the latest construction techniques and systems that lower energy consumption. It is hoped that the lessons learned from the construction and monitoring of these buildings will assist in reducing the energy usage of future schools. Ireland’s national energy supplier partly funded the buildings’ energy saving features and the costs of monitoring the buildings. A third low energy school is at the planning stage.

The benefits of low energy schools go beyond reduced CO₂ emissions. The environmental impact of the Gaelscoil and Raheen school buildings throughout their life will be a fraction of that of a traditional building construction, and the occupants will have the satisfaction of knowing that their building respects the environment. Low energy buildings also improve comfort associated with increased daylight levels and the users’ ability to control natural ventilation. In addition, these schools provide an ideal opportunity for students to learn about responsible building technologies.

The objectives for the schools were to provide quality educational facilities appropriate to their users’ requirements. The project not only encompasses low energy design, but also involves providing feedback to the Department of Education and Science on the schools and their systems’ operation, and using the buildings as active resources for learning about energy conservation and sustainability.

Through the use of advanced energy and daylight simulation software, the design team were able to gain a better understanding of how the buildings would react with their environments, and understand how these reactions could be used to improve the school environment while minimising energy consumption.

Gaelscoil An Eiscir Riada, Tullamore, Co. Offaly

The design for this eight-classroom primary school aimed to consume 20% less energy than a similar school built to current good practice standards, to generate zero CO₂ in the operation of its services and to show sustainability in its construction. The project is complete and in use since 2003.

The Gaelscoil is equipped with a detailed monitoring system that provides information vital to understanding energy and water use in school buildings. The building and its systems will be monitored in detail over the coming years. An advanced building management system was installed to gather information on the building’s performance and to assist the occupants in adjusting the controls to ensure minimum energy wastage.

To consume less energy, the Gaelscoil’s design team gave attention to reducing infiltration, selecting building materials, using natural ventilation and daylight, and installing a rainwater recovery system and an advanced heating system. A touch-screen display teaches the building’s users about the school’s energy use.

Infiltration, heat loss due to unwanted air leakage, is typically a major source of energy wastage, particularly when a building is unoccupied overnight. Heat slowly leaks out and more energy is needed to bring the building back up to temperature the following day. This school had its air tightness tested by forcing air into the building under pressure and measuring the leakage. Leakage routes were also tracked using smoke tests. The thermal insulation levels specified were double those required by the building regulations, to reduce the energy escaping from the building fabric.

Consideration was given both to the energy used during the building’s construction and to selecting materials that are responsive to the environment. A lightweight timber frame structure was chosen that minimised the environmental impact of construction.

Particular attention was paid to providing adequate natural ventilation. Engineers carried out detailed simulations to optimise distribution of ventilation air within the classrooms.
The building plan was arranged with most of the windows facing east to benefit from the sun’s free heat. Using natural daylight in all classrooms also makes it possible to turn off the energy consuming lights for most of the year. During daylight hours, artificial lighting should not be required in classrooms for at least 80% of the year. Careful design of the windows, using advanced computer calculation methods, insures that the correct daylight levels are achieved. In addition, advanced lighting controls have been used to prevent lights from being left on when they are not required.

Rainwater is collected from the roof of the building and used for flushing toilets.

A ground source heat pump was selected as the building’s heating system in order to minimise CO₂ emissions. Water arrives at the heat pump after passing through a number of pipes beneath the ground outside the building. The pump moves heat from the ground, which effectively acts like a huge solar collector, into the building. An underfloor heating system is used to create a low flow temperature from the heat pump. The underfloor system stores heat, thus allowing the heat pump to be operated during the night when electricity rates are cheaper. The performance of the heating system is carefully monitored.

At the Gaelscoil, the electricity to run the heat pump and the rest of the building is taken from a group wind scheme, therefore generating no CO₂ in the building’s operation.

The Gaelscoil project incorporates a touch-screen display positioned near the school’s entrance that is linked to the Building Energy Management System (BEMS) and provides the children and visitors with energy and environmental information related to the building. A cartoon character is used on the screen to encourage the children to learn about the building construction and its day-to-day energy use. The touch-screen system is also connected to the Gaelscoil’s ICT system and can provide BEMS information to any computer in the school for classroom-based project work.

Raheen National School, Raheen, County Laois

Raheen National School is a new three-classroom school designed for sustainability. The building promotes low energy use and good daylighting levels through attention to insulation, air leakage, rainwater, heating, lighting methods and roofing. The school is in use since 2003.

A sophisticated dynamic thermal model of the school was created using a computer program by Lawrence Berkeley National Laboratory (United States). The program simulated over 150 different permutations and combinations of building and systems configurations and compared capital and running costs. Many of the resulting recommendations related to architecture, with a view to reducing energy needs by passive solar heating, natural lighting and so on. Building orientation was studied, as well as numerous constructions with different insulation types.

The school is of timber frame construction, which made it possible for thicker insulation to be used than in conventional cavity wall constructions. The wall insulation is of cellulose (recycled newspapers), which was sprayed into place once the building was water-tight. Analysis compared the advantages of a heavy structure against a light one, and the lightweight structure was found to be more beneficial, mainly due to the shorter hours and smaller number of days the school is in use compared with other institutional buildings. The lightweight structure was also preferred because it allows the school to respond more rapidly to its heating system (to heat up quickly and to benefit from solar gain more immediately), whereas a heavy inner wall leaf would take all day to store solar heat and only release it after the students had left for the day.

The mechanical and electrical engineers noted that typically a large part of the energy to heat a building serves to heat air entering the building due to infiltration. As part
of the project’s architectural specifications, an air leakage rate and a test to verify the school’s air-tightness were recommended. An “air leakage index” of 5 m³/hr/m² at 50 Pascals pressure was specified.

Pressure testing¹ was executed, using specialist equipment. The purpose of the pressure test is to find unknown leakage paths and seal them. The first test showed leakage rates above the specified value. During the test, the building was filled with artificial smoke, and the locations where it emanated from the building demonstrated the predominant air leakage paths. A subsequent pressure test met the intent of the specifications.

Raheen uses rainwater for sanitation purposes. Rainwater is collected from the roof and filtered before being stored in a purpose-built storage tank. In dry weather, the tank is allowed to become almost empty at which point automatic controls maintain a minimum level of water by topping up with local mains water. The quantity of water delivered to the toilets and the quantity of mains make-up water is recorded hourly by a building management system linked to the Department of Education and Science’s engineers in Tullamore, Co. Offaly. The results indicate the efficiency of the collection system and give insight into the quantity of water used in toilets. The logic for using rainwater in toilets is strong: it reduces the burden on both the local mains water delivery system and storm sewage disposal system. A detailed simulation of the rainwater collection system was carried out for various tank sizes, and a computer model was developed for the project, which estimates hourly demand and available rainwater throughout the school day.

Before choosing a heating system for the building and the domestic hot water, comparisons were carried out of different mechanical and electrical systems such as the following:

- Oil fired space heating with radiators, versus ground source heat pumps coupled with underfloor heating.
- Modular boilers using between one and four boilers.
- Heat pump water heating, versus centralised oil fired domestic water heating, versus decentralised electric domestic hot water heating.
- Weather compensating controls.

The studies concluded that in the absence of natural gas, conventional oil fired boilers with radiators would offer the lowest CO₂ emissions. One boiler serves for heating both the building and the domestic hot water.

High fluorescent lighting is used throughout the school; however to reduce the level of artificial light when there is sufficient natural light, automatic photocell-controlled dimming and switching of luminaries was installed. All linear lamps are equipped with electronic ballasts. The fittings near windows have dimmable ballasts whose output is controlled by a photocell mounted on the ceiling. Separate light switches are provided for the normal lights and the dimmed lights. In response to daylight, manual switching of lighting was chosen, after considering several schemes involving automatic variable dimming.

The school’s circulation spaces are principally lit by daylight from above. In the corridor and lobby, photocells automatically switch the lights on when the natural lighting level drops below 150 lux. The corridors are so well lit with skylights that the lights only come on during the very dullest of days. Neon indicators on the switches serve as a reminder to switch the circuits off at night.

1. Some feel a dichotomy exists in pressure testing schools. On the one hand, a leaky school will waste energy; on the other hand, a school requires permanent background ventilation to reduce the risk of condensation. Raheen’s engineers Overy and Associates argue that no dichotomy exists since the permanent background ventilation openings are provided in known amounts.
In the storerooms, lights with integral infra-red presence detectors are installed. No wall switch is provided for these lights, making it impossible for them to be left on when the room is unoccupied.

For exterior lighting, compact fluorescent and high pressure sodium lamps are used. Exterior lights for safe entry and egress are switched on by a photocell and off by a timer. This ensures that they only come on when required at dusk but do not remain on all night. Security lighting is provided by floodlights with PIR sensors.

The roofing materials were selected to achieve a balance between their ecological, energy efficient and practical functions. The roof system, the same as used for the Gaelscoil, has a lightweight green roof option that enhances the insulation performance of the build-up. The roof also has a low embodied energy, continuously processes CO₂ gases through photosynthesis and serves as a specific learning tool for the pupils through supporting micro-ecosystems. Its sedum blanket contributes to rainwater attenuation and provides external noise absorption.

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AUSTRALIA’S FIRST PUBLIC PRIVATE PARTNERSHIP SCHOOL PROJECT

The design and construction of nine schools has commenced in Australia using a Public Private Partnerships (PPPs) methodology. This is the first project in Australia where social infrastructure has been acquired in this way.

PPPs are arrangements commonly used in the United Kingdom and throughout European Union countries to acquire social infrastructure such as toll roads, rail projects and bridges which derive an income for the private sector operator. However more and more projects involve developing hospitals, prisons and schools, where the infrastructure provides little or no income for the developer; the developer relies entirely on government payments for its income.

The Australian project is being managed by the New South Wales (NSW) State Government through its Department of Education and Training, the country’s largest provider of educational services. The PPP contract for the new schools has been let to Axiom Education Pty Ltd who is financing the design and construction of the schools and providing facilities management services including building and grounds maintenance, security, and cleaning for the 30-year period of the contract. The Department of Education and Training pays a monthly fee for the schools being “available” for classes.

The advantages recognised by the government of entering into a PPP arrangement of this type include increased attention to education and cost savings. The school’s

1. The Department operates over 2,200 schools and 130 post-secondary education colleges and manages AUD 15 billion in assets.
administrators are able focus on delivering educational services without concerning themselves with day-to-day facilities management problems. Cost savings of up to 7% have been achieved when compared to the way schools are designed, constructed and managed under existing arrangements. Building cost savings are achieved through the economies of scale which results from packaging the nine schools together. This packaging also translates into savings during the design and facilities management phases of the contract.

The new facilities, located in new urban release areas of the state, include six primary schools (years kindergarten-6) with an enrolment capacity of 400-630 students; a school catering for 85 students with physical and/or intellectual disabilities; and two secondary schools (years 7-12) with an enrolment capacity of 1 000 students. (See table 1.)

The capital cost of the schools is estimated to be AUD 90 million, and the net present value of the entire contract is approximately AUD 133 million.


### From tender to construction

The tender phase of the contract presented difficulties for the project team as there were no precedents for this type of contract arrangement in Australia. However the team was able to gather a great deal of information and benefit from the experiences gained in the United Kingdom on similar school projects, as the laws of the two countries are comparable. The project's financial advisers and lawyers were able to provide personnel who had had direct United Kingdom experience. This proved to be invaluable in finalising the project's tender documents and in creating the assessment and final contract documentation.

To begin the tender phase, a request for registration of interest by the private sector was advertised publicly and closed in November 2001. Eleven submissions were received and these were eventually short-listed to four.

A request for detailed proposals was then called from the four short-listed organisations. Next, documents were issued to two bidders requesting best and final offers. Bids were received from both consortia.

In December 2002 the government announced that Axiom Education Pty Ltd had been awarded preferred bidder status. Financial close was achieved, and the contract became commercially enforceable in March 2003.

Construction commenced immediately on four of the nine schools; these were completed and classes begin in January 2004. All of the remaining schools are expected to open in January 2005.

For more information, contact:

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<td>Baulkham Hills</td>
<td>Special needs</td>
<td>85</td>
<td>January 2004</td>
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<tr>
<td>Glenwood</td>
<td>Blacktown</td>
<td>Secondary</td>
<td>1 000</td>
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<td>Horningsea Park</td>
<td>Liverpool</td>
<td>Secondary</td>
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</tbody>
</table>
Academies such as Bexley are independent, publicly funded schools for children of all abilities; they are sponsored by business, faith or voluntary groups working in innovative partnerships with central government and local education partners. These independent state schools are not maintained by the Local Education Authority. They are funded directly by the Department for Education and Skills, though a parity of funding with schools in the maintained sector that operate in similar circumstances is ensured. Their independent status allows them the flexibility to be creative in their management, governance, teaching and curriculum and to find innovative solutions to meet local needs.

The Bexley academy, which specialises in business and enterprise, accommodates 1,350 students aged 11 to 18 in Thamesmead in the London Borough of Bexley. It replaces Thamesmead Community College which was located on the same site.

This article describes the principle of academy sponsorship and how the government-appointed project manager contributed to the Business Academy Bexley, along with the project’s open building design.

Academy sponsorship

The principle of academy sponsorship is a simple and effective one. Private enterprises, educational philanthropists or charities become sponsors of academies and contribute up to GBP 2 million towards their creation. Each academy is wholly independent and is owned and run by a private charitable trust company. This company is permitted to engage in trade in order to generate profits, which are then ploughed back into the academy, enhancing the quality and nature of the infrastructure, the equipment, and the rewards to teachers and support staff.

It is intended that the sponsor be the chairman of the trust company and of the governors, and appoint the majority of the governors, drawing them – as is the case of Bexley – from the world of industry, commerce, science/medicine and finance, as well as from the local community.

Revenue funding is provided by the Department for Education and Skills (DfES) at comparable levels to maintained schools.

Project manager

The DfES appointed a commercial, not-for-profit company to manage the project. 3Es Enterprises Ltd involves a team of consultants with experience in teaching and managing education processes. 3Es was the first private
company to take over the management of the regeneration and creation of a state school.

3Es assumes that all schools wish to be successful and works to remove any barrier stopping them achieving this objective; this ethos was built into the educational design of the Business Academy Bexley. The new ethos replaces over-didactic teaching, long cheerless corridors and the endless summoning of bells, with an innovative curriculum, enrichment activities, the renewed importance of the form tutor, links with business and industry, and high aspirations and expectations for all.

Building design

The Business Academy Bexley is an innovative building that aims to stretch the boundaries of education. The project’s open, transparent and compact spaces were designed to encourage integration and communication between students of all age groups, students and teachers, students and visitors, and all the different educational disciplines in the curriculum, as well as to forge links with the local community.

Working within DfES guidelines, the present chief executive of the academy and the architects developed an open-plan compact design based around three courtyard spaces devoted to business, art and technology. The project aims to provide a safe, exciting and enjoyable environment for out-of-hours extra-curricular activities.

The courtyards link teaching spaces on different levels as well as those dedicated to different educational disciplines. The teaching spaces are separated from each other only by partitions (which can be moved to change the size of teaching areas or to adapt them for other uses) but are open to circulation space and courtyard space.

There are no corridors, and pupil circulation occurs through the business court, art court and technology court at ground level or along the courtyards at levels one and two.

The large business courtyard (measuring 450 m²) is the social hub of the school, housing a café at ground level and a theatre, television studio, editing suite and fully equipped gymnasium above. It is also home to a “trading pit” or mini stock exchange – with large plasma screens – offering students their first taste of trading stocks.

On a 33-acre site, the three-storey building totals 11,800 m². The piled steel structure has exposed precast concrete floor slabs, stick curtain walling, external sun shading, membrane roof construction and glazed roof-lights.

To minimise energy use and provide optimum conditions, the building is capable of reducing heat loss in the winter and, through its double-layered facade with external shading louvres that automatically track the sun’s path, capable also of reducing heat gain during the summer.

In order to link the building to its community, an existing foot bridge (which was largely unused) was demolished and replaced with a pedestrian crossing. The school’s entrance is now visible from the crossing, and its presence can be felt by local residents and commuters alike.

The Business Academy Bexley opened in September 2002. From commencement of construction to official opening was a period of less than 20 months.

In future Bexley will include a primary section and a nursery with crèche, becoming one of the first “cradle to university” schools in the United Kingdom.

Bexley is the government’s flagship academy, pioneering the way for other independent, publicly funded schools. UK government ministers have long-term plans for a further 52 academies to be developed in partnership with business to regenerate education in deprived communities.

For further information, contact the architects:
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Fax: 44 020 7738 1107/08
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August/September

29 August - 1 September – LETA 2004 will address the topic “Sustainable Learning for a Sustainable Future” and will take place in Adelaide, Australia. Contact: Keith Maynard, e-mail: maynardk@bigpond.net.au

September

5-8 – An OECD conference on “School Bullying and Violence” will take place in Stavanger, Norway. The event will be organised jointly by the OECD, the Norwegian Ministry of Education, the Norwegian Board of Education and Stavanger University College. Contact: SBVconference@oecd.org

13-15 – The OECD Programme on Institutional Management in Higher Education will organise its 17th General Conference in Paris, France. The conference is entitled “Choices and Responsibilities: Higher Education in the Knowledge Society”. Contact: Valérie Lafon, OECD/IMHE, tel.: 33 (0)1 45 24 75 84, e-mail: valerie.lafon@oecd.org

October

6-10 – “Planning in Today’s Political Context: Challenges to Educational Planners” is the theme of the 34th Annual Meeting of the International Society for Educational Planning (ISEP) to take place in Washington, D.C. The political influence of various groups, individuals and movements around the world will be explored along with various phases of educational planning. ISEP is calling for papers for presentation at the conference; the deadline to submit original manuscripts is 1 July. Contact: Glen Earthman, Virginia Tech, Virginia (USA), tel.: 1 540 231 9715, e-mail: earthman@vt.edu

20-22 – The Third International Congress on the Development of Physical Infrastructure in Education will be held in Nuevo Vallarta, Mexico. It will be organised by the Administrative Committee of the Federal Programme for School Construction of Mexico (CAPFCE) and will focus on the following issues related to educational spaces: innovative projects, new materials and technological advances, security, and social participation. Contact: congreso@capfce.gob.mx

21-24 – The Council of Educational Facility Planners International will hold its 81st Annual Conference and Trade Show in Atlanta, Georgia (USA). For more information, visit www.cepfi.org/conferences

November

1-4 – The PEB seminar on information and communications technology and educational property management will take place in Montreal, Canada (see page 2). Contact: Isabelle Etienne, OECD/PEB, tel.: 33 (0)1 45 24 92 72, e-mail: isabelle.etienne@oecd.org

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