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Designing Tomorrow's School

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FEATURE

DESIGNING TOMORROW'S SCHOOL

A seminar entitled "Designing Tomorrow's School" was organised by the OECD Decentralised Programme on Educational Building (PEB), the Irish Ministry of Education and Science and the National University of Ireland (NUI), Galway, and was held in Galway, Ireland, in September 2002. The seminar addressed new approaches to school design. As reforms seek to improve educational standards, the planning and design of schools for the future has become the focus of attention in many OECD countries. The meeting sought to identify current trends in school design at the international level, as well as the factors that are affecting the design of school buildings and how school building designs are responding to those challenges. It examined the extent to which information and communication technologies impact on the design of educational facilities and how school building design reflects the priorities of sustainable development.

Education is being seen increasingly in many OECD countries as crucial for the development of economic growth and social being, a role largely corroborated by several recent OECD studies. Education is considered as one of the most important social and political priorities, to which much effort is dedicated in financial terms. As the size of the educational sector grows both within OECD countries and elsewhere, governments are mobilising resources to build educational facilities that respond to new demands.

Within that context, architects and educators in many countries have set out to design the "school of the future" and policy makers are trying to make the best choices in terms of school planning and management. All are facing major challenges as trends that set the environment in which schools will operate in the future are in constant evolution. If educational facilities do not simply reflect those changes, their design is undoubtedly strongly influenced by them. Equally, the quality of the delivery of education and training in today's knowledge society depends to some extent on the appropriate design of educational buildings. Facilities must be of good quality, be flexible and meet the needs of their users.

The need to identify and analyse trends in school design, with a view to producing policy recommendations about the shape, size and general configuration of the school of the future, is therefore of concern to all OECD countries. On some aspects countries have known similar developments and face similar challenges. Of primary importance is the impact of new information and communication technologies on the design of facilities. Educational buildings must also respond to the challenges of sustainable development, another major priority set by OECD countries in the field of education. In recent years Ireland, the seminar host, has shown pilot developments in designing sustainable educational buildings as well as in integrating information and communication technologies to those facilities.

The discussion about school building construction and the criteria on which it should be based does not only lead to the identification and the definition of innovative approaches at the level of design. Indeed, the design stage is closely linked with other aspects of the provision of educational facilities, and most particularly with financing issues. In that context, OECD countries have developed different approaches involving combinations of central and local funding, increasingly with a private sector element.

The seminar looked at some recent attempts to conceive the school of tomorrow and to give an idea of what has been concretely achieved and what developments can be expected in the near future. The event concentrated on existing examples of innovative institutions in various countries and attempted to define some of the basic concepts that will affect the future of school buildings, while taking into account the points of view of planners, architects, teachers and students.

Certain presentations made at the seminar are summarised here. Nicolas Chung of France's Ministry for National Education spoke on "Developing digital work areas for education". Giorgio Ponti of Cisem (the Research Institute of the Province of Milan and Italian Provinces Union) presented "The school of the future: an Italian perspective". Naoto Fukabori from Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) addressed "The trend in measures for school facilities in Japan". Jaime de la Garza of Mexico's Administrative Committee for the Federal Programme of School Construction (CAPFCE) spoke on "Multifunctional classroom facility: a challenge for tomorrow's education".

DEVELOPING DIGITAL WORK AREAS FOR EDUCATION IN FRANCE

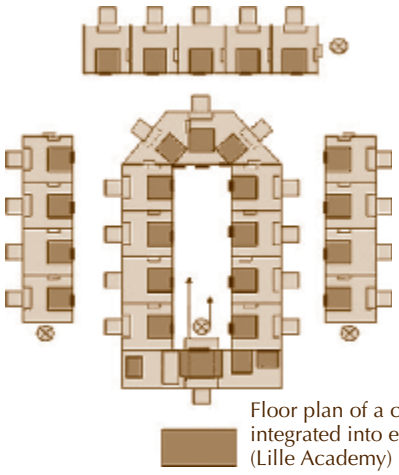
The development of information and communication technologies (ICT) is resulting in the emergence of new digital services for education: management and production of digital contents, communications and co-operative work tools, the organisation of school life, etc. The French Ministry of Education is pursuing an active policy of putting these services together as a genuinely coherent and personalised package for schools, aimed not only at students and teachers, but also at parents and administrative staff. Genuine personal "digital work areas" will in fact be made available on the Internet, both in school and from home or a municipal library.

The advent of new educational tools does, as a general rule, impact on the human organisation and infrastructure (computer or not) of the school and can ultimately promote change in the instruction provided. In the case of ICT, the impact is considerable and, as a corollary, means rethinking the above-mentioned factors. We shall deal mainly with infrastructure in this instance.

The first point to consider is the effect of the massive investment by schools in computer equipment and networks. This poses a problem in schools that were not designed for this purpose. Cabling the buildings and making the materials physically secure can be extremely expensive, while freeing classrooms for computing poses organisational problems.

Designers of new buildings have for their part to see the rapid change in technologies as an unavoidable and partly unpredictable factor. The "traditional" multimedia rooms equipped with networked office computers are showing their limitations. Teachers are asking for ICT installations and methods of use to be diversified, this being made possible by the greater mobility of the equipment (portable computers and inexpensive wireless networks, and soon, connected PDAs, tablet PCs, etc.) and the development of digital services online. Mobility also means that teachers and students can envisage having their own personal equipment, instead of using shared equipment.

As a result, it is possible to imagine ICT being used virtually anywhere. Architects are therefore faced with problems to do with workplace ergonomics, as well as more practical problems: the storage and securing of valuable mobile equipment, luminosity (for reading on-screen),



Floor plan of a classroom with computers integrated into each student's workstation (Lille Academy)

sound and heat (the machines generate a lot of noise and heat), recharging the equipment, the distribution of peripherals (such as printers and scanners which are not as mobile), etc.

More significantly, the introduction of ICT is gradually calling into question the traditional teaching relationship determined, as in classical theatre, by the unities of place (the classroom), time (the timetable) and action (the class) and clearly identified players (the teacher and class).

This is because digital work areas make it easier to work outside the classroom, and even outside the school, before and after class (thanks to asynchronous communications tools), and to bring in people from outside. This facilitates work in small groups of students and/or teachers and makes the classroom less of a central concept. With this being a developing trend, the nature and layout of teaching areas will have to be completely rethought with the object of making the real and the virtual more complementary, opening schools up to their environment and enhancing continuity between the closed realm of the school and the world represented by the global network. In this context, success depends to a large degree on work area flexibility and adaptability.

For further information on digital work areas, visit:

- the ICT site for education in France: www.educnet.education.fr
- the report by the general education inspectorate on schools and digital networks: ftp://trf.education.gouv.fr/pub/edutel/syst/igen/rapports/rapportfinal.pdf

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THE SCHOOL OF THE FUTURE: AN ITALIAN PERSPECTIVE

The logo of the intelligent school building project

In the Italian scientific and educational community, the school of the future has already been given a name: the intelligent school. It is defined as an ideal grouping of physical spaces, technology and equipment able to rapidly respond to a large number of community and educational needs for today and the future in an open relationship with other social activities available to the public.

Cisem has tried to identify the important features of the school of the future by analysing buildings constructed by expert designers in a number of countries and by analysing needs specific to the Italian context. The key features of an intelligent school are described below.

Adaptability and flexibility

The building must be adaptable to various teaching methods, to diverse uses, to the introduction of new technologies and to size variations. An intelligent school should guarantee expansion or modification of spaces when needs change. The building should be organised in basic units, whether educational or service blocks, whose features allow them autonomy, insuring the maximum adaptability and flexibility over time. Each section of the school building should have independent access.

Flexibility is a prerequisite for electric installations, heating systems, waterworks and sanitary fittings, as well as multimedia and computer science laboratories.

Performance qualities

Introducing building automation systems and networks (see below) can contribute actively and passively to this feature.

Environmental and bio-architectural qualities

The school building can play a primary role in influencing students' behaviour towards the environment. It is therefore important to apply all the elements needed to ensure optimal conditions with attention to shapes, colours, lighting, materials, safety, health, comfort, energy savings and cost.

Automation systems and energy savings

An intelligent school should have a complete and all-encompassing systems network which is easy to integrate and to maintain, and the reduction of structural or size restrictions. Functions such as lighting, plumbing and heating should be controlled separately with dedicated sensors or interface. Once these various systems are integrated into the design, one interface tool – a computer that uses dedicated software – should manage all the building's functions. To avoid installing miles of dedicated wires, a single BUS line can connect and exchange information between the various components of the systems and the interface terminal.

A project called ZEP (zero energy pollution) is also being studied to run the building almost completely on alternative energy sources (*e.g.* photovoltaic cells, solar panels and geothermal energy), reducing air pollution.

A scholastic centre in a redevelopment area on the outskirts of Milan, built according to a design type for the Province of Milan and Cisem

Cost, savings and financing

An intelligent school is estimated to cost approximately 20% more than a new or restored traditional building: 5% more for better quality materials, 10% more for advanced energy systems and 5% more for building automation. However the future savings of an intelligent school, essentially linked to management costs and real estate operations, are estimated at 40% to be amortised over a ten- to 15-year period. Calculations show that an intelligent school would finance itself after ten or 15 years.

The first intelligent school, for primary education, has been designed and is being built in the city of Quattro Castella in Italy's Emilia-Romagna Region.

See the Web site www.n2d.it/isb

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Diversification and flexibility in subject matter and study methods

The multipurpose space has been introduced progressively so that various forms of study, such as simultaneous lessons or large or small group study can be chosen according to the subject matter.

With the growing popularity of studying in groups, which often requires a large, flat space, desks were improved to make their heights even so they can be grouped together to form the working surface needed.

School library services have diversified. The library has taken on the role of media centre, providing not only books but all media required for educational activities.

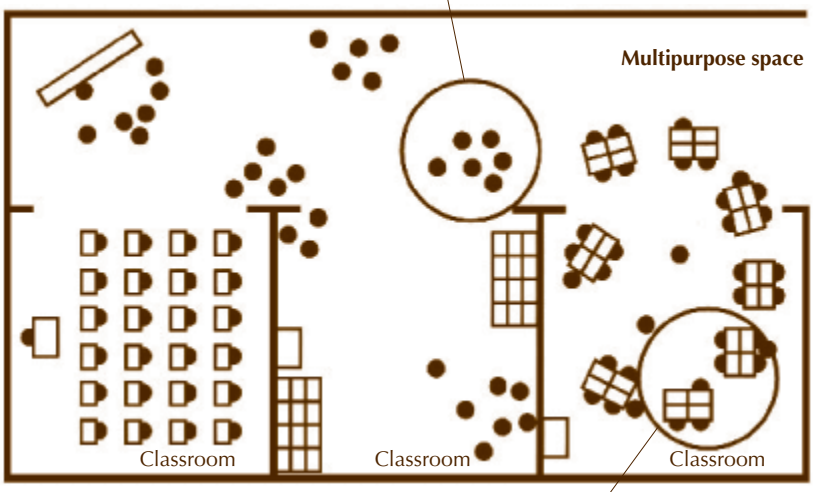
Adapting to changes in society

In response to the world's environmental problems, MEXT has developed "eco-schools" to reduce the burden on the environment. These schools serve as full-scale teaching materials for environmental education.

Pupils using a multipurpose space

MEASURES FOR SCHOOL FACILITIES IN JAPAN

The measures relating to school facilities in Japan today respond to three needs: co-operation with the local community, diversification and flexibility in subject matter and study methods, and adapting to changes in society.



Co-operation with the local community

School facilities are now required to open their doors to the local community. They respond to community demand for life-long learning and serve as an emergency base for the community.

When disaster occurs, school facilities plan an important role as emergency shelters for local residents. In order to enhance and strengthen disaster prevention capabilities, MEXT has improved the earthquake resistance of school facilities and has built storehouses and swimming pools with water-purifying functions in schools.

An example of group study

MEXT is promoting the development of the classroom equipped with terminals for an intra-school LAN and other information devices in order to use information technology to its maximum in teaching.

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MEXICO'S MULTIFUNCTIONAL CLASSROOM FACILITY

The multifunctional classroom facility is a school complex project designed to facilitate computer-assisted teaching in the future, in any of the languages spoken throughout Mexico, in order to reach the large number of students in isolated rural areas. CAPFCE conceived this facility to meet the challenge of educational space, incorporating teaching and technological tools along with a proper architectural design. This project is part of the Ministry of Education's goal to provide a quality education to all of its citizens.

The multifunctional classroom facility will be composed of three cells, totalling 10 800 m^2. Each multifunctional cell will accommodate 80 to 96 students and include these facilities:

- four classrooms (for 20 to 24 students);
- an administrative office;
- a technical support office;
- a sanitary services area (30 m^2);
- a small storage room for teaching materials adjacent to each classroom (the classroom and storage room combined equal 87 m^2);
- an open area connecting all the classrooms (632 m^2);
- an electronic library space (32 m^2);
- a concession area or small student lounge.

The facility is designed for community interaction, serving as a centre for social events in addition to education. It includes an outdoors amphitheatre, a playground and a basketball court. The buildings are on a single level, in consideration of people with mobility handicaps.


Mexico's multifunctional classroom facility

Materials used to build the facility will come from the local area. This lowers costs and customises the building in accordance with the city or region's local culture.

Teaching in these rural facilities will be overseen by a local tutor using lessons provided via video-conferencing and a multimedia system that allows for the use of Intranet, Internet (for consulting libraries abroad and exchanging ideas with students from elsewhere through discussion groups), DVDs, etc. Each classroom will be equipped with a video projector, camera and interactive whiteboard. The pupils will have specially-designed worktables that house a computer terminal.

The proposed classroom will be easy to install, maintain and use for various purposes.

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A bird's eye view