

The Quality of School Facilities and Their Maintenance
Report on the international conference in Vienna
21-23 September 1998

*Space is not a passive container
where we accommodate objects and shapes ...
Space in itself is the OBJECT (of the process of creation),
and it is the main object! (...)
SPACE gives the joy and freedom of IMAGINATION
to uncover (...) its BOUNDLESSNESS, its secrets (...).*

(Tadeusz Kantor on space in: *Ein Reisender –
Texte und Manifeste*, Nürnberg 1988, p. 46)

Space, or rather school space, the quality of educational facilities and their maintenance was the topic of a conference organised from 21 to 23 September 1998 in Vienna by the Federal Ministry of Education and Cultural Affairs in association with the Austrian Institute for School and Sports Facilities (German acronym: *ÖISS*) and the *land* of Upper Austria, and opened by the Federal Minister of Education and Cultural Affairs, Ms. **Elisabeth Gehrler**.

What factors make up the quality of a school? Is it architecture, interior design and furniture, or the ability of teachers to convey knowledge, or simply the readiness of students to acquire knowledge?

One of the most provocative questions regarding school buildings is the influence the built environment has upon the performance and behaviour of students and faculty. **Glen I. Earthman** of the *Virginia Polytechnic Institute & State University*, USA, has asked this question and presented a number of answers. He explains that in recent decades various US scientists have made this issue the focus of investigations. *Englehardt*, for instance, explored the motivating effect of equipment and design features of a school building on student and teacher behaviour. Colours and room temperature, too, may have a positive or negative influence on individuals inside a building. *Bowers* and *Burkett* even go a step further. They see a correlation between physical environment and health, achievement, attendance and behaviour of users. *Philips* states that there is a relationship between the age of an educational facility and the student reading and arithmetic achievement scores. He found that achievement scores increased 7.63 percentile ranks once students had moved to a new and better facility.

It may be hard for a rational mind to accept some of the postulates included in Mr. *Earthman's* paper. There is, however, benefit that can be derived by the designers of a school building from examination and use of these research findings. Food for thought is also provided by the table with examples of negative impacts of a poorly equipped and maintained facility on academic achievement (Fig. 1).

In this context we have to see the report and research project introduced by **Christian Rittelmeyer**, assistant lecturer at the Pedagogic Institute of the Göttingen University, who has investigated how students perceive different types of school buildings, and what design and colour features make a facility *likeable* or *unlikeable*. The study is based on a survey of 500 students and experiments with the effect of design features on the physical well-being of students.

His study reveals that our entire sensory system is involved in the perception of any built environment. Depending on how our physical being is addressed by the colours and shapes of educational buildings, we respond by liking, disliking or being indifferent to them. The reason for this is that, when perceiving any given setting, our orientation within space is ensured by an interplay of the senses of vision, own movement and balance. Looking at differently coloured school facilities may change the heat processes on the body surface, thus influencing the way in which individuals perceive certain spaces to be *warm* or *cold*. The human body acts like a kind of resonant body responding to specific external impressions by changes in skin temperature.

School design must *keep abreast of time*. However, it is fashionable trends that frequently go against a student's inner, though unconscious, need for balance and harmony. While considering the anthropological and social aspects, we have to ask ourselves what is the historical context within which we place students and teachers. This does not mean that nowadays students ought to be blessed with the attributes of barracks-type architecture, the classicist demonstrations of monarchic power, the strictness of monastic schools, or the lack of character in some of today's design landscape.

Various surveys conducted among the student population have revealed that educational facilities are perceived in terms of gestures and signs: they are described by students as playful, friendly, distant, brutal, dead or lively. Schools are perceived to be likeable when their shapes and colours are varied and stimulating, when they provide a sense of

freedom, do not inhibit their users, and when their attributes are of a certain warmth and softness. As a rule, slants and gradients in a building will always interfere with an individual's sense of equilibrium. If they are very pronounced, this will result in a kind of visual battle of the individual against such a design feature although the individual is not aware of it but has the feeling of being confronted by a hostile architecture. (Fig. 2).

Rittelmeyer's findings show that a school building compatible with student needs requires comprehensive planning and design that goes far beyond mere technological issues and has to include anthropological, historico-regional and social aspects.

In 1996, on the occasion of Austria's millennium celebrations, the Federal Ministry of Education and Cultural Affairs commissioned *Diether S. Hoppe* of the Vienna University of Technology to take stock of the quality of Austrian school facilities built over the past two decades and determine their positive and negative impacts. The outcome of this study is presented at the conference.

Aside from the analysis of relevant literature, approx. 20 schools completed in the past 15 years have been included in the study, among them also compulsory schools. Mr. *Hoppe* and his project team focus on six aspects, namely urban development, typology of space quality, additions/conversions, technology/efficiency, extramural use, plus planning, design and execution. For reasons of fairness the project team has made it a rule that only one building of any given architect would be examined, and that the samples taken should be evenly distributed across the entire Austrian territory. The study does not restrict itself to an evaluation of facilities by outside experts but includes an in-depth analysis made in co-operation with their users as they are the ones that perceive the design quality of a school building day in day out. Three examples out of the facilities included in the study are selected for presentation at the conference.

The point of departure for the study has been a retrospective of the development of public urban space towards the end of the 19th century and the construction of educational facilities in Austria since 1945. School buildings range from the traditional corridor-based schools via pavilion-type and residential-type schools (1953) to atrium schools (1961), which constitute the first step towards hall constructions. Some of the so-called school location communities (*Schulstandortgemeinschaften*) created in the 1970s to introduce a more economic approach to school building by uniting several kinds of schools on joint premises have opted for designs emulating the hall constructions of the 1960s, whereas others have opted for schools that are obviously experimental in both conception and design. Recent developments have shown that a blend of hall and corridor constructions is best suited for educational facilities. A fine example of such a school is the academic secondary school in Vienna's 11th district, Geringergasse 4, which is visited by the conference participants (Figs. 3 and 4).

The focus of continuing education-type schools in Austria, but not only here, has shifted away from new buildings and towards the following policies:

- Adapt existing, former non-school buildings to educational needs.
- Extend existing educational facilities to meet changed functional and organisational requirements.
- Rehabilitate existing educational facilities that require such action because of natural wear.

In view of greater school autonomy, the development of communication technologies and individual school profiles the importance of specific functional spaces – such as school libraries turned into information and communication centres, assembly halls and multi-function spaces, economic, business administration or technology centres, or extramural uses – is growing. This, in turn, makes it necessary for architects to adopt a more comprehensive approach to planning and design and involve the users at an early stage.

Just like Hoppe, *Francisco Garcia de Paredes* refers to the significance a school building has for urban development in general and for its attendance area in particular. He illustrates the factors governing the quality of our built environment, such as external conditions, conditions of comfort, conditions of use, structural conditions and symbolic conditions and the policies adopted in Spain to ensure the quality and maintenance of school buildings.

If we take a closer look at federal schools located in Vienna, we recognise, as *Alfred Haider* of the Vienna School Board explains, a few particularities. The relationship between old and new, the dependence on well-tested concepts plus the need to be open to new ideas are characteristic of the current situation of Vienna's federal school buildings.

The construction programme for educational facilities in the 1980s was based on the assumption that population figures would stagnate. To meet the then existing additional space requirements in the short term, vacant compulsory school spaces of the City of Vienna were rented. Due to eastern opening, however, the situation reversed, i.e. high migration rates resulted in major space bottlenecks in compulsory schools. This new situation has forced federal authorities to

provide more space for its Vienna-based schools by constructing new educational facilities and enlarging existing ones. The demand for new buildings goes hand in hand with the demand to rehabilitate and adapt the old school buildings, most of them dating from the monarchy. In addition, Vienna's vocational schools are in great need of additional space.

The creation of *BIG* (*Bundesimmobiliengesellschaft* ≈ federal property company) initiated a dynamic process which has resulted in sustained effects, improved performance and structural reforms in many administrative domains. In the Vienna area, around 85% of federal schools have already been handed over to *BIG* for the purposes of usufruct and asset management. *BIG* was created in 1992 by a special law. Its task is to manage the buildings and premises of the federal government that serve public purposes, and it should do so under landlord and tenant law and property market principles.

In terms of school maintainer in Vienna, the federal government is confronted with the dichotomy of urban renewal versus urban development and expansion. That is why the current educational building programme of the federal government is still pursuing a strategy of reconciling these two objectives. It is primarily based on the federal government's school development programme (German acronym: *SCHEP*), which has been regularly updated or renewed since 1971. Regarding the annual maintenance, repair and improvement policies in Vienna the following distinction is made:

- *BIG*/structural/lessor-related maintenance as part of the rent to be paid by school administration
- lessee-related maintenance, in particular minor repairs.

The decision made in 1997 by the Federal Ministry of Education and Cultural Affairs to introduce a three-year budget line for maintenance measures at federal schools constitutes a major quality improvement, whereas the added options for planning and making the necessary arrangements result in a better use of resources. In terms of designing and installing any new equipment for federal schools, the Vienna School Board has developed an organisation chart for the purpose of finding the greatest common denominator for all the expectations, desires and needs of those involved in any given project.

A special area is highlighted by *Martin Kapoun* of the Vienna School Board in his paper. For room sizes, those involved in any planning and design process have to comply with the existing pre-defined standards. An exception to the rule within this maze of regulations and standards are the recreation and circulation zones, which account for up to 40% of the net ground-plan area. If we take a closer look at this 'deregulated' surface of a school, we see that very different solutions have been adopted which reflect society's requirements at the time of school construction. 50% of all Viennese federal schools were built before or around the turn of the century. These usually L-shaped schools feature generous circulation zones which are naturally lit and aerated. Order, or rather maintenance of order, was a major design principle then. As from 1930, Vienna had its own building code defining the essentials of corridor and stairwell dimensions. The few schools built in between the wars have added another function to corridors: they feature accessible latticed cages, i.e. cloak rooms, which are located near the classrooms. Along with urban extension in the 1960s and 1970s a reevaluation of the corridor zone took place. Schools built in those years boast a central hall stretching across several storeys and used for communication and exhibition purposes. Also atrium-type schools with their typical enclosed central courtyard-cum-meeting-place became increasingly important. The Vienna building code, too, has changed and now includes provisions on the proper design of circulation zones for the disabled (minimum width: 1.80 m).

Recent trends are in the direction of wider corridors emphasising individual solutions. Adventure and activity areas within circulation zones are to raise student curiosity, info corners give access to virtual playgrounds. Canteen and library zones, or rather learning and information centres, are adjacent to such adventure areas or merge into them.

A rather exciting solution has been adopted by the architects *Riepl+Moser* for their addition to the academic secondary school in Wels, Wallerstraße. An aluminium-clad truncated cone forms the central entrance to the school and houses a functional assembly hall. This aula is used for any kind of function, event, exhibition, but it also serves as a central common space. This Wels school illustrates that the creation of open spaces will become one of the central issues of future design features as they offer new options for communication and creativeness (Fig. 5).

Represented at the conference by its acting chairwoman *Marion Planck*, the interdisciplinary task force *Lebensraum Schule* (school - a living space) of the Upper Austrian School Board and the chamber of architects and engineering consultants for Upper Austria and Salzburg deals with such issues as ensuring the quality of school buildings in general, implementing exemplary building projects and minimising the follow-up costs through holistic school design involving alternative energy systems and local use of the school as cultural centre for the community in general.

To achieve these objectives the task force has adopted 10 guiding principles which are as follows:

1. Ensure proper quality for schools as a place of sojourn
2. Design inviting communication zones
3. Create open schools, i.e. facilities with appropriate leisure options and ambient features
4. Encourage the holistic use of schools as cultural centres
5. Have central bodies define only the basic requirements to be met by a school building
6. Give users a say in the planning and design process
7. Provide for an efficient feedback and evaluation system for translating current data into practice
8. Employ only highly qualified design professionals/architects for school building
9. Develop a generally applicable blueprint
10. Consider that changes in school organisation require equivalent building changes

The above guiding principles of *Lebensraum Schule* are currently being implemented in the addition built to the Vöcklabruck-based academic secondary school at Wagrain castle. The project is presented by the headmaster of this school, Mr. **Erwin Rauscher**. It is designed to turn the massive three-sided castle into an enclosed whole, thus making the school a place of both education and socialisation as demanded by the guiding principles of the task force (Fig. 6).

The Austrian Institute for School and Sports Facilities (German acronym *ÖISS*) has, in association with **Rupprecht Ottel**, updated the specifications on physiological conditions and ambient features of school building, which date from the beginning of the 1970s. In his paper, Mr. *Ottel* highlights those areas that are frequent sources of concern in school building, such as room climate, lighting, acoustics or sound insulation, health and safety.

In preparing these quality standards, the *ÖISS* has been guided by the principle of generally applicable and largely cost-neutral standards. The recommendations are distributed among the conference participants and illustrated by a number of examples. For instance, any room air temperature exceeding 25°C will result in discomfort and reduced performance. Aside from insolation and sunshading, room air temperature is determined by the rate and time of ventilation in conjunction with storage mass. This combined effect of storage mass and ventilation is based on the phenomenon that the storing materials take up and accumulate the heat delivered by insolation, warm fresh air and indoor heat sources during the day and give it off later to the cool night air. Heat conduction through walls does not suffice for this kind of heat transportation, i.e. at night there is a need for an air change between outside and inside air. For this purpose, no-weathering exposed vent openings are required which enable the cool night air to pass through the building. To make best possible use of this natural type of ventilation we need generously spaced and variable vent openings.

Aside from the above issues, there are a number of non-quantifiable impacts of the built environment that would require further study. The influence exerted by building materials and ground would be one example.

If school is supposed to be not only a place of conveying learning contents but rather a space for living and gathering experience, room dimensioning and design must be geared to both the function of gaining knowledge and that of developing socialisation skills.

A frequently used, sometimes abused current keyword that can hardly be ignored by economically thinking and acting individuals is that of facility management. It is an important but often undervalued precondition for ensuring the teaching, learning and living quality of schools.

The activities of *BIG* within facility management range from acquiring to managing premises, explains its director **Hartwig Chromy**. Since *BIG* does not only take over existing federal property against usufructuary rights but also acquires ownership, any property available and intended for future use by public administration must be subject to detailed examination (project study) prior to being purchased. Also in the design and implementation phases of a new facility, priority must be given to the economy of acquisition and use. Since any new school facility requires a tenancy agreement with the Federal Ministry of Education and Cultural Affairs before being built, it is necessary to have possibly accurate cost estimates at a very early stage for determining the level of the future rent. Also the cost for maintenance, operation and repair have to be included in such estimate. To ensure compliance with the projected costs, *BIG* only tolerates an overrun of estimated costs by up to 5%. If, however, the cost estimate is exceeded more, the designer will not receive any fee for the excess amount. As the rent is calculated for investment to be refinanced after approx. 20 years, it is necessary for the funding agency to watch capital markets closely.

If measured against the total service life of a building, the costs of use amount to 150% of the original cost. For this reason, the quality of building execution and thoughtfulness in installation design play an essential role. Although not

part of its original functions, calculating and minimising follow-up costs are important tasks of *BIG*. An example of this philosophy is the tender for contracting out energy management at 45 Viennese schools.

For Mr. *Josef Lischansky*, sales and customer service manager of *Energie Comfort*, the notion of facility management includes all those services that are not directly related to a school's core area, i.e. education. Facility management, as he puts it, includes such areas as engineering management (operation, service, maintenance, energy management, etc.), commercial management (comprising, *inter alia*, the proper maintenance of the building fabric, administration of the property), infrastructural management (cleaning) and management of use (building management, renting as landlord and lessee, or surface management).

If we break down management costs of a building, energy would account for 45%, cleaning for 20%, maintenance for 25% and other costs for 10%. Energy costs, which offer the greatest savings potential, can be subdivided into heating (65%), electricity (35%) and water (5%). Energy contracting in this context means that the contractor supplies the agreed power quantity at the agreed price and is also responsible for operating the respective technical equipment. In efficiency contracting the investments necessary for energy conservation purposes are covered by the difference between the now lower energy consumption and the former energy costs.

The Feldbach-based federal school centre (Styria) has conducted an energy contracting project in co-operation with *Honeywell*. Its head teacher, Ms. *Edith Resnik*, presents the experiences made by her school with this project. The reason why it was initiated was that the school's heating system was to be changed to long-distance mode and that a high energy bill was expected. The project was implemented in several steps. After having compiled the necessary data (energy statistics, curricula, movement pattern of classes, events, letting to third parties), the project managers discussed concrete policies of reducing running cost. The adopted measures were, *inter alia*, an optimisation of energy supply contracts by reducing the connected load and an adaptation of lighting. Then, *Honeywell* prepared a service package that also includes a 24-hour service hotline. The positive example of the school centre in Feldbach illustrates that school administrators ought to encourage co-operation between schools and contracting firms.

Last but not least, *Alan Jones* from the Department for Education and Employment explains the Asset Management Plans (AMPs) developed in 1998 for British schools.

The purpose of these AMPs is to make available to all those people and bodies involved in building schools the data and information needed to make decisions on premises, assure their quality and provide value for money.

The main objectives of AMPs are, *inter alia*, to provide an agreed basis for local decisions on spending priorities, encourage partnership projects and ensure that a local consensus on priorities is reached while recognising the need for greater transparency.

AMPs are developed in several stages:

1. Assessing existing premises, and as a consequence
2. Identifying future needs
3. Defining priorities
4. Conducting feasibility studies and option appraisals
5. Implementation, review and evaluation

The timescale for AMPs is five years with all school types being involved.

The conference on *The Quality of School Facilities and Their Maintenance* has clearly demonstrated that now, much more than a few years back, we are approaching questions of school building and maintenance with much greater care as a result of the experiences gathered in recent years. Today anyone who produces a botched school building despite the existence of so many good and bad examples has no excuse whatsoever and is to take the blame. It ought to be the willingness and duty of everyone involved in the planning and design process to consider carefully all the available options, including artistic ones, and act accordingly.

(Doris A. Karner)