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1ST AD HOC EXPERTS' GROUP MEETING ON EVALUATING QUALITY IN EDUCATIONAL FACILITIES, 1-3 JUNE 2005, LISBON, PORTUGAL

Introduction

Quality learning environments are a prerequisite for quality education. Badly-lit, poorly-ventilated classrooms do not enhance educational effectiveness; students' learning can be compromised in learning spaces that are inflexible or inaccessible; and students' lives may even be at risk if the school building is poorly constructed. Some case studies show that the involvement of the building's users – students, teachers and community members – in decisions regarding the design, planning and management of educational spaces can have a positive effect on student motivation and educational outcomes.

While many countries have identified the evaluation of the quality of new and existing building stock a policy priority, no consensus has been reached on how "quality" is defined, nor how "quality" can be effectively measured as it relates to educational facilities. From 1 to 3 June 2005, the OECD Programme on Educational Building and the Ministry of Education in Portugal gathered together 23 international experts − architects, social scientists, academics, school and facility evaluation specialists, and representatives of state and national administrations − from 11 countries (Australia, Austria, Brazil, Greece, Ireland, Mexico, New Zealand, Portugal, Switzerland, United Kingdom/Scotland and the United States) and UNESCO to discuss them (Annex 1). The objectives and related themes of the *ad hoc* experts' meeting on evaluating quality in educational facilities were threefold:

1. *To define a set of international principles and criteria for assessing quality in educational facilities*. This theme explored the concept of "quality in educational facilities", as defined by current research, practice and policy. It also reflected on the constraints and possibilities of establishing universal principles and criteria of quality.

2. *To discuss methodologies used to measure these criteria in different countries*. This theme investigates the nature and effectiveness of existing methods by which quality has been measured in different countries, as it relates to educational facilities, and the transferability of these methods.

3. *To consider options for an international methodology for assessing quality in educational facilities.* While studies such as the OECD Programme for International Student Assessment (PISA) seek to define and measure quality learning environments, few international studies have focused on the importance of the built environment in providing quality learning environments. In this theme, experts were asked to make recommendations for international methodologies or research tools.

This report summarises the findings of the experts' group on evaluating quality in educational facilities. It is organised in three parts. The first part provides a summary of the presentations from the first theme of the meeting, addressing the nature and international transferability of design principles and criteria for assessing quality in educational facilities. It concludes by presenting the conclusions of the first working group on this theme, outlining a preliminary framework of seven principles for assessing quality in educational facilities and factors to take into consideration when defining quality framework for educational buildings. The second part of the paper describes the different tools that have been used to assess quality in educational facilities, as presented by experts in the second theme of the meeting, and the results of the working group on this topic. The final part of the report makes a series of recommendations for further work in this area, in addition to presenting issues for further consideration.

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Defining principles and criteria for assessing quality in educational facilities

Introduction

Presentations and discussion in the first theme of the meeting highlighted the need for the creation of a general framework that incorporates universal principles for assessing school building quality. This framework should seek to "bridge the gap" between architecture and education, addressing the fundamental question of "How do education facilities contribute to educational goals, educational effectiveness and educational policy?". Another underlying assumption of a framework is that quality of educational infrastructure is an important contributor to *school quality*. However, caution must be exercised when applying these principles to other contexts, and contextual factors, such as educational policy priorities and the existence and architectural interpretation of building codes and regulations, must be considered.

Summary of presentations

Development of standards to assess quality of educational buildings in Maryland (Allen Abend)

In 2003, a school facilities survey was conducted in the State of Maryland, United States, to review the adequacy of its educational buildings to support educational programmes. Phase I of the project involved the evaluation of 1 342 school buildings against 31 standards identified as having the most potential for impact on educational programmes and learning:

- Health and safety (*e.g.* indoor air quality, fire safety, lavatories).

- Educational programme support (*e.g.* human comfort, acoustics, student capacity).

- Instructional areas (*e.g.* pre-kindergarten, elementary, secondary, technology and special needs education).

- Instructional support areas (*e.g.* adequate space for health services, food services, teacher planning areas).

Phase II of the project identified the costs of bringing schools up to the standards identified in Phase I. Results of the survey indicated that an estimated USD 3.85 billion is required to bring schools in the State of Maryland up to these standards. While the standards defined in this survey may not be transferable to other contexts, there are universal concepts relating to the definition of standards (*i.e.* standards should be specific, measurable and assess building condition and educational adequacy against minimum standards), survey development and implementation (*i.e.* many parties should be involved in the development of the survey instrument; inspectors should be carefully selected, multi-disciplinary and uniformly trained) and data collection, entry and analysis (*i.e.* a verification process must be established to assess accuracy of the data).

An international model for addressing design quality in educational facilities (Teresa Heitor)

A comparative analysis of the planning and design of 21 schools in eight countries for students aged 10 to 18 years revealed a matrix of programmatic design "concepts", "decisions" and "principles" that must be considered when addressing design quality in educational facilities at the design development stage.

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- *Programmatic design concepts*. Nine programmatic concepts – learner-centred, developmentally and age-appropriate, safe, comfortable, inclusive, flexible, open to community use, sustainable and inspirational – should underlie all school building design.

- *Design decisions*. Each programmatic design concept relates to a design decision: site design, building layout and appearance, movement strategies, construction processes, building materials and finishing, equipment and furniture and environmental features.

- *Design principles*. Design concepts and decisions can be grouped in three categories according to their comprehensiveness in the school building design brief: performance attributes (*i.e.* building services, construction-related issues and building utilisation); appearance and amenity attributes (symbolic significance, contextual impact and aesthetics); and mandatory requirements.

Although each school building design is the product of a complex and unique interplay between educational, physical, social, organisational, financial, pedagogical and affective factors, a holistic "design brief" based on international design principles can be used to evaluate how the school's physical space can best support educational goals, while ensuring long-term, optimal use of the facility.

Using criteria of quality in education to assess school building quality (Lutz Oertel)

In Switzerland, a school quality model – comprising inputs, processes (school-level and teaching and learning level) and outcomes of the educational process – was developed to assess school and educational effectiveness. Material and financial resources, which would include school buildings, is one of three inputs in the model. While certain aspects of school quality have led to the development of national and international instruments, quality criteria and indicators, the way in which the built structure contributes to the processes and outcomes of schooling has received little attention. In Switzerland, this is due largely to the diverging normative views of architects and educators. Architects reject notions of the "correct" room or building plan, and believe that educational success is due to teachers and organisation of learning, and not to the building. Although the school building administration, which has a more functional perspective, advocates flexible, multi-purpose, safe classroom clusters, with areas for public access, it does not evaluate its effectiveness. For educators, the relationship between educational quality and the quality of the built environment is difficult to demonstrate.

To "bridge the gap" between architecture and education in Switzerland, multi-disciplinary assessment teams must establish a procedure to evaluate school building quality, using dimensions of *school quality*. Such a process must also consider the normative-based arguments that underlie educational requirements and architectural principles as they relate to quality. Further research must also be undertaken to investigate the nature of the relationship between the built environment and education quality.

Developing Quality Indicators in the Design of Schools (Sebastian Tombs)

The Quality Indicators in the Design of Schools is a simple tool designed to rate the design quality of new or existing schools. The instrument, developed by the Royal Incorporation of Architects in Scotland, was used to assess the quality of new and refurbished schools in the 2003-04 Public Private Partnership programme in Scotland.

Eight design categories were developed to reflect the social, functional, aesthetic and performance factors influencing school design:

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- *Functionality*. Uses and spaces, access and external environment.

- *Building quality*. Engineered systems and performance, and construction.

- *Impact*. Character and form, internal environment, social integration, and sustainability and ecology.

For each category, there are up to 11 elements with a number of check items. For example, for the category "access", respondents use a ten-point scale to rate aspects of welcome, pedestrian and cycle access, car and bus access and parking, service access, emergency exits, security of the site, access for the disabled and access for emergency vehicles. This tool could be used as part of future post-occupancy evaluations.

"Anything goes" (Christian Kuehn)

Humans, their social institutions and buildings are highly mutable, rendering any definition of rules and criteria of quality a difficult task. Two case studies in Vienna, Austria – Public School Absberggasse and Lauder Chabad Campus – demonstrate how schools that are the same size, programme and location but follow radically different design principles are both examples of quality educational buildings. Although systematically assessing architectural performance is important, a building's quality is always more then the sum of its parts. Any general set of criteria should therefore be very short, easy to understand and presented with caution.

In Austria, successful design of educational facilities is a result of good clients, a good brief and a good architect, which is usually selected by competition. However, there is a persisting divide between architects and educators that must be bridged in order for architecture to better reflect changes in society and pedagogical principles.

Outcomes of working group 1

The focus question for the first working group was twofold:

- What are the principles of "quality" in relation to existing and future educational facilities? These may include generic concepts such as context of evaluating school facilities (*i.e.* education system, community, etc.).

- Which criteria should be used to define these principles?

The search for broad quality principles

Seven broad quality principles of "quality" in educational facilities and related focus questions were defined. These principles are concise, well-defined, measurable and not overly prescriptive.

1. Fit for purpose

Does the building enhance teaching and learning (i.e. is the space flexible; is it inclusive/can it accommodate all learners, taking into consideration curriculum requirements and learners' age, level of education, gender and physical and academic abilities?)?

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2. Inspirational

Does it have character and display architectural, educational, socio-cultural or technological ambition/innovation (e.g. 21st century learning environments)?

3. Stakeholder involvement and satisfaction

Does the building meet the needs of all users? Are multiple stakeholders involved in the design, planning, and day-to-day management and use of the facility? Does the facility serve as the centre of the community? Are there examples of public-private partnerships in the history of the facility?

4. Environmentally sustainable

Does the building demonstrate efficient use of energy, water, local or natural resources and renewable systems?

5. Healthy, safe, secure and comfortable

Does the building meet health and safety standards? Does it meet with acoustic, ergonomic and thermal standards or is it comfortable? Does the building address specific health, safety or comfort issues or problems?

6. Cost-effective

Are the building construction and life cycle costs sustainable?

7. Holistically planned and managed

Is the building true to the design brief? Is the building managed effectively?

These principles and focus questions will form the basis of a conceptual framework, or matrix, that demonstrates the relationships between these principles, focus questions, educational policy and design.

Considerations when defining quality

An understanding of the relationship between architecture, educational effectiveness and educational policy is fundamental to the establishment of any framework or methodology that addresses the evaluation of educational facilities. To investigate how these three domains inter-relate, a number of variables must be considered:

- *Audience. i.e.* How do students, teachers, non-teaching staff, school administration, facility and asset managers, the community, the media, educationalists, academics, architects, researchers and policy makers define a quality (built) learning environment? What is their role in evaluating the design quality of a facility?

- *Existing design standards, guidelines and data. i.e.* Facilities should also be evaluated against existing design principles, (minimum) standards, norms, legislation, regulations and guidelines established by educational authorities. Existing data or inventories of educational facilities should also be analysed against these standards.

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- *Temporal factors. i.e.* Could the framework and methodology be applied for both existing and new educational facilities, and for all phases of the building's life cycle?

- *Spatial factors. i.e.* How can a framework and methodology consider the use and function of educational space (fixed vs flexible infrastructure, specialised vs multi-purpose teaching space and shared vs non-shared teaching space)?

- *Educational factors. i.e.* Would the framework and methodology consider all levels of education and institutions: pre-primary, primary, secondary, post-secondary and tertiary?

- *Other contextual factors.*

    − Pedagogica/organisation of learning factors (*e.g.* student-centred vs teacher-centred learning, didactic vs interactive learning, fixed curriculum vs flexible subjects).

    − Economic factors (*i.e.* level of capital investment).

    − Historical (*e.g.* historical buildings, heritage areas) and physical/geographical (*e.g.* urban vs rural, local vs regional vs national) factors.

    − Political factors (*e.g.* centralised vs decentralised systems).

    − Socio-cultural factors.

    − Human/community factors (*e.g.* levels of community commitment).

Identifying effective methodologies

Introduction

A number of methodologies presented in this theme have been used to successfully evaluate the quality of the built environment. In some cases, qualitative and quantitative methods have been combined. Others, like post-occupancy evaluation, which has been implemented in Brazil, New Zealand, Portugal, the United Kingdom and United States, use a variety of qualitative techniques such as interviews, observation, walkthroughs and focus groups by one or several evaluators, with a high degree of stakeholder involvement. In Greece, Mexico and Portugal, inventories of school accommodation have been established to identify areas of greatest need, with a view to establishing best practice guidelines.

Summary of presentations

Projects on evaluating the quality of educational facilities in Portugal (José Freire da Silva and Rosa Silva)

In Portugal, four projects have been initiated to assess quality of school building stock over the last 10 to 15 years:

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1. *Characteristics of existing school property*. In 1997, a study was launched by the Studies and Planning Department (GEP), now GIASE, on the condition of 997 primary and secondary school buildings, date of construction, building use, building type, property size and equipment.

2. *Diagnosis of existing laboratories in secondary schools*. In 1999, an on-line inquiry was undertaken at the request of the Secondary Education Department to assess how existing school infrastructure could support the introduction of new curricula in experimental sciences. Data from 330 schools were entered into a central database. The study's report recommended the construction of over 250 new laboratories at an estimated cost of EUR 21 million.

3. *General survey of school facilities*. In 2002, as part of an audit of the whole educational system by the General Inspectorate of Education over a period of eight years, a general survey of 1 130 school facilities is being conducted. A manual and an exhaustive checklist were completed, to be used by teams of inspectors conducting the surveys. Although large amounts of data were produced, results are inconclusive. Results of a mini-survey on the user's image are not yet available.

4. *Appraisal of the development of a culture of safety and well-being at schools*. The programme seeks to evaluate specific aspects of school management – the effectiveness of self-evaluation, the effectiveness of learning in the early years, and the culture of safety and well-being in a school – by evaluating the compliance of the actual school environment against an established quality standard or norm. Each standard comprises indicators with leading questions. School inspectors will use observation and interviews to conduct this survey in 300 schools from 2005-07.

Currently, two evaluation-related projects are also underway. In collaboration with the Instituto Superior Técnico, the Ministry is developing an evaluation methodology to determine how schools are prepared to resist seismic activity and how to reinforce them. The Ministry is also looking to develop adequate and simple tools to conduct qualitative evaluation of basic and secondary schools to guide further interventions on educational facilities projects, using such methodologies as post-occupancy evaluation.

A Post-Occupancy Evaluation in progress at Pendão School in Portugal (Chris Watson)

In May 2005, a post-occupancy evaluation was conducted at the Galopim de Carvalho School, located on the outskirts of a Lisbon neighbourhood. The school has over 800 students from diverse backgrounds, including rural communities, ex-Portuguese colonies and socio-economically disadvantaged areas. To meet the needs of these students, the school was rebuilt in 2001, and equipped with a new multi-media resource centre and computer networks. However, problems with lack of space and teacher training in audio and video production, ICT maintenance and Internet access prompted the Ministry to undertake a post-occupancy evaluation to identify strengths and potential improvements to the school building, from the stakeholder's perspective.

The POE methodology is user-centred, subjective and involves all stakeholders. It perceives building decisions as a social and political process, which is neither logical nor consistent, and one that requires continual negotiation with stakeholders in all phases of planning, design and use. Thus, the use of criteria to measure the quality of facilities is avoided. Walkthrough interviews with users, including five students, and eight staff, and five project staff were the principal method used in the POE. Other methods included a survey, discussion forum, observation and project review. The methodology had been successfully used by the principal evaluator, Chris Watson, in a number of educational and non-educational settings in

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Australia, New Zealand and the United Kingdom. Despite the cultural and language differences between the principal evaluator and the stakeholders, the group's active participation, heterogeneous composition and effective communication throughout the evaluation process revealed a number of important issues concerning, for example, access to sports facilities, air quality, thermal comfort and security.

Statistics and indicators on educational facilities and equipment (Manolis Baltas)

The Evaluation School Buildings Indices Quality System (ESBI-QSYSTEM) is a series of 22 questionnaires on educational infrastructure. The surveys were implemented in 64 schools in the Greek municipality of Attica from November 2004 to February 2005. The surveys, which contain 410 items, requested data on:

- Number of students enrolled, classes, teachers, and foreign and SEN students, by level of education.

- Number, ownership and age of school buildings, by level of education.

- School operation times, by level of education.

- Number and size of teaching and non-teaching (indoor and outdoor) spaces, by level of education.

- Number of schools with certain safety and security features and structural faults (*e.g.* parapet faults, cracks in building).

- Number of schools with maintenance requirements, by level of need (five levels, from immediate action to no action) and type of structure or amenity (16 structures including staircases, insulation, garden, boiler room, etc).

- Availability, condition (new, old or very old) and immediate and short-term requirements for school equipment and furniture, such as computers, libraries, etc.

These data were used to compile educational infrastructure-related indicators on use and availability of space and equipment; facility and equipment age, condition and need; and safety and security requirements. Each of these indicators has important implications for quality in education and educational facilities. The questionnaire will be implemented in other Greek provinces, and has potential applications in an international context.

Working towards a quality framework in Mexico (Jaime de la Garza Reyna)

In Mexico, 150 000 school buildings were constructed between 1944 and 1992, which accounts for approximately 80% of today's educational infrastructure in Mexico. The 1992 decentralisation agreement resulted in a change in education sector policy regarding school buildings, with issues such as maintenance, refurbishing and new projects receiving increasing attention. For these reasons, Mexico, through the Secretariat of Public Education, is developing two new guidelines:

- *Location of educational property*. These guidelines establish the minimum requirements to select a suitable property on new school grounds. Its objective is to inform local authorities

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about geological and other factors that may affect the school population during the facility's lifecycle.

- *Quality of educational spaces*. These guidelines, initiated by CAPFCE, focus on ICT, furniture and equipment (*e.g.* specify requirements for redesign of school furniture), and safety and security issues. A number of programmes – an educational infrastructure diagnosis and needs analysis, designer and planner co-ordination plan and regional design contest – will inform, monitor and measure the implementation of the guidelines.

The development of these guidelines represents a strategic, participatory approach to the quality and needs of existing infrastructure, which will raise awareness of the needs of future educational settings and influence future policy. The guidelines will be enforced within the Federation jurisdiction.

Conducting post-occupancy evaluations in schools in Scotland (Keith Thomson and Chris Watson)

In Scotland, guidance on conducting school building evaluations was published for local education authorities as part of the Scottish Executive's commitment to undertake the country's largest school rebuilding programme. Post-occupancy evaluation was considered the most appropriate method to promote a culture of collaboration – collecting feedback from users and sharing outcomes with all stakeholders, including local education authorities, teachers, students, parents, facility and maintenance staff, and the design and building team – for improving the fit between facility design and use, taking into consideration budgetary and time constraints. The specific purposes of the evaluations are to fine-tune new buildings; improve design for future buildings; demonstrate best value in terms of its efficiency, cost-effectiveness and fitness for purpose; build stakeholder commitment; and evaluate existing buildings in the planned refurbishment projects. Interview walkthroughs, which are recorded and photographed, in addition to survey, observation studies and experts' scans, are used to evaluate users' needs concerning the built environment. A final report contains recommendations on the building's performance, as identified by its users.

In 2003, a demonstration post-occupancy evaluation was conducted by the Scottish Executive and Chris Watson at Craigmour Park Primary School. The school has 310 students with 100 students in nursery school. The POE was conducted in collaboration with 35 students, teachers, parents and others. Users made recommendations relating to driveway safety, fencing, the surveillance system, garden, flooring, surface of the play area and position of whiteboards in the classrooms. An evaluation of the POE endorsed the use of the methodology – which is practical, simple, efficient and produces clear, representative results through a participatory process – as part of the School Estate Strategy in Scotland. In the future, a more comprehensive case study will be undertaken at a secondary school in Falkirk involving a larger and more varied group of stakeholders, followed by workshops for local authorities.

Conducting post-occupancy evaluations in schools in Brazil (Sheila Ornstein)

In Brazil, post-occupancy evaluation has been used over the last two decades by researchers at the University of São Paulo in Brazil to evaluate the performance of the built environment from the perspectives of the building's users and specialists. The resulting diagnosis – which considers user's needs and satisfaction as they relate to the functional aspects of the building, construction system, comfort, cost-benefit and maintenance – provides feedback for managing the quality of the planning, programming, design and construction process, and the use, management and maintenance of the built environment. The evaluation process is characterised by its multi-disciplinary, inter-disciplinary and holistic nature, which

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espouses a systemic and integrated vision of a built environment. Many school buildings in São Paulo are of similar construction, making such a vision more feasible.

A number of qualitative methods are used to evaluate user's and specialists' needs and satisfaction with the built environment: observation (using video and photos) and mapping of activities and behaviours; walkthroughs by experts; open, free or semi-structured interviews with students, teaching and non-teaching staff and maintenance personnel; face-to-face questionnaires; small one-hour focus groups with all stakeholders; and students' drawings or essays. Data from POEs can be used to provide important quality and performance measures for educational facilities, such as quality indicators, norms and regulations, codes, guidelines and examples of best practices for all phases of an educational facilities' life cycle.

POEs conducted in Brazil indicated user dissatisfaction with levels of environmental comfort (*i.e.* classroom temperature, noise levels and suitability of furniture and equipment), security and accessibility for students with disabilities. Specific recommendations of the POEs are to improve space management, observing the relationship between room size and the educational function and number and age of students; provision of ICT; fire and accident safety and security against intruders; accessibility; comfort conditions; and maintenance management. In general, there is a need for more flexible, stimulating learning environments that complement the educational process. This can be achieved through intensive participatory design, and using POEs to inform school facility planning and maintenance.

Outcomes of working group 2

The focus question for the second working group was:

- How can we combine methodologies to provide guidelines to policymakers for improving quality in new and existing educational facilities?

The evaluation process

The process of evaluating quality in educational facilities must follow several broad guidelines. It must be:

- *Multi-disciplinary and inter-disciplinary*, bringing together experts and others from the fields of education, architecture, engineering, child psychology, anthropology, environmental psychology, sociology and public policy.

- *Participatory*, ensuring early and continuous feedback with policy-makers, students, teaching and non-teaching staff, parents, educationalists, financial bodies, architects, the media, facilities and asset managers and researchers.

- *Holistic*, providing a systemic and integrated vision of a built environment throughout all phases of the facility's − from planning to project delivery to occupation and management − and society's life cycles.

- *Multi-method*, incorporating aspects of appropriate qualitative and quantitative methods into the research design.

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- *Purposeful and valid*. Research questions, objectives, process and timeframe of the study must be clear, tangible and ever-present. Evaluators must be neutral, trained and accredited by external authorities.

- *Policy-oriented.* Evaluation must respond to and influence policy.

Evaluating methods

Post-occupancy evaluation, inventories, performance measures, benchmarking, guidelines and regulations, best practice case studies… Presenters in this theme described a number of different studies that use one or several qualitative and quantitative methods: observation, interview, walkthrough, questionnaires (data analysis), focus groups and visual selection. The effectiveness of these methods is influenced by such factors as the scope of the study (*i.e.* local, regional or international context; one or multiple schools), type of research questions and desired outcomes of the study, policy and research interest, and availability of human and material resources. Experts agreed that any future study should combine research methods. But how can we choose the most appropriate method? Figure 1 shows a matrix that identifies and rates the strengths and weaknesses of available methods according to a number of constraining factors (Figure 1). Figure 2 shows the relationship between the different studies presented in the course of the meeting.

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Figure 1. Rating of research methods for evaluating quality in educational facilities

10=strong 1=weak	Ease of access intelligibility	Resource use cost/time	Comparability consistency	Applicability of results	Creative ideas	Intera ctive	Total
Observation	0	4	3	5	3	0	15
Interview	10	8	5	7	4	2	36
Walkthrough	10	7	4	10	6	4	41
Questionnaires	3	4	10	2	2	0	21
Focus groups	7	3	4	8	8	10	40
Visual selection	6	6	5	3	5	4	29

Figure 2. Evaluation structure
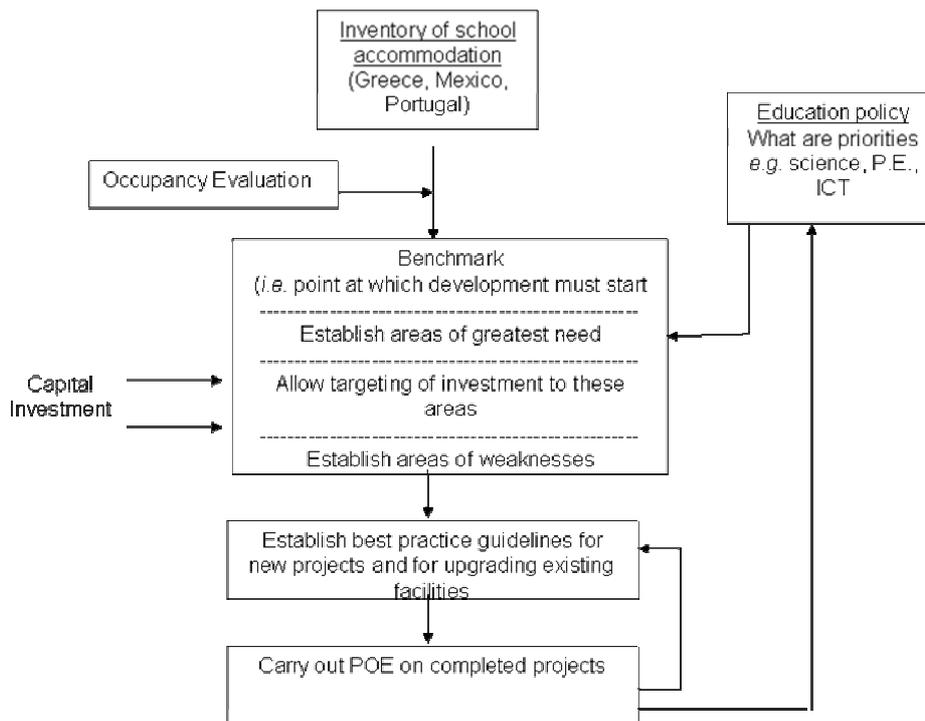
The state of current research on effective learning environments (Kenn Fisher and Claudia Tamassia)

While learning environment research, development and evaluation has traditionally focussed on facility technical performance, using a range of post-occupancy evaluation tools, the development of approaches that relate learning environments to learning outcomes is relatively new.

Quantitative studies. A number of recent studies have attempted to build "evidence-based" performance measures by comparing aspects of building condition with student performance on test scores. Results are inconclusive, although more research must be conducted in this area.

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- The Programme on International Student Assessment (PISA), measures the performance of 15-year-olds in reading, mathematical and scientific literacy and the factors that influence the development of these skills at home and at school, including the provision and quality of schools' physical resources, in 41 countries. In the PISA 2000 and PISA 2003 school questionnaires, school principals were asked about the extent to which they perceived that learning was hindered by inadequacies of certain physical and educational resources, such as the condition of buildings, heating, cooling and/or lighting systems, instructional space, instructional materials in the library, multi-media resource for instruction and facilities for the fine arts. Data indicate that in OECD countries schools' physical infrastructure – as perceived by school principals – has a negligible net effect on performance.

- In 2001, PriceWaterhouseCoopers conducted a study at the request of the Department for Education and Skills in the United Kingdom to assess the relationship between school capital investment and student performance, measured by the percentage of students in each school attaining a certain Key Stage in mathematics, reading and writing. Interviews were conducted with 27 headteachers and LEA officials, and data were collected from over 1 500 schools on amount of capital spending and adequacy of accommodation as assessed by OfSTED inspectors. A multivariate analysis was conducted to assess the impact of capital investment on performance. Results revealed some evidence of a relationship between student performance and capital investment, although interviews, which examined the nature and strength of the relationship, yielded more positive findings.

Qualitative studies. Qualitative measures of performance appraisal, which are often used with quantitative measures, can establish more direct relationships between learning environments and learning outcomes.

- Henry Sanoff at North Carolina State University has developed classroom rating scales, and indoor and outdoor learning space rating scales. Susan Wolff at the National Research Center for Career and Technical Education University of Minnesota has defined 32 design features that support collaborative, project-based learning.

- The OECD PEB Compendium of Exemplary Educational Facilities and DesignShare awards use selection criteria that emphasise the role of design in providing effective learning environments. School designs, for example, are judged according to how they stimulate early teaching and learning experiences, how they are adapted to new forms of learning and research, and how they accommodate the needs of all learners. The current international focus on measuring learning outcomes and empowering 'student voice' might be examined to see if such a focus could provide a more appropriate measure of the performance of learning environments.

- In New Zealand, the Ministry of Education conducted a study to understand the factors that influence learning outcomes in classroom environments. Interviews were conducted with all stakeholders, and a survey was completed by 139 teachers, 263 students, 14 principals and 12 trustees in primary and secondary schools on classroom space, adaptability, comfort, adaptability to different learning environments and accessibility.

- In Victoria, Australia, pedagogy-space performance measures are being developed as part of the Developed Leading Schools Fund (LSF), which is investing $AUD 80 million in capital for new or redeveloped facilities and/or ICT infrastructure. Schools are currently bidding for funding

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based on pedagogical, curriculum, professional development, technology and learning environment design strategies. A range of methodologies, including POE and PISA, are being investigated to measure the success of the project.

- In the United Kingdom, the Department for Education and Skills, United Kingdom, in co-operation with the Building Research Establishment (BRE), has developed a system (BRE-EAM – BRE Environmental Assessment Method) for assessing the environmental performance of both new and existing buildings in terms of site management; energy use; health and well-being; air and water pollution; transport-related CO_2 factors; land use; ecological value conservation and enhancement of the site; environmental implication of building materials, including life-cycle impacts; and water consumption and efficiency. A single score or BRE-EAM rating is based on environmental performance assessment criteria levels.

Although there is a growing amount of literature on the relationship between pedagogy and design of learning environments, further research is required to better understand how to measure the educational effectiveness of the built environment.

Recommendations for future work

A proposed approach

To further this work, the OECD Secretariat, on the advice of the experts' group, proposes a two-year international activity on evaluating quality in educational facilities, involving a small number of interested countries. In the short term, if the PEB Governing Board agrees in principle to this activity, a small working group comprising experts and representatives from participating countries would meet to agree on a guiding framework for the activity, including a methodology, implementation schedule and budget. The activity structure, which would combine qualitative and quantitative tools, could include two main areas:

1. *School studies*. A small, representative sample of educational institutions – from pre-primary to tertiary-level – would be selected for occupancy case studies. The methodology for this study would involve questionnaires, walkthroughs, interviews and focus groups involving multiple stakeholders to evaluate the needs and satisfaction of users.

2. *Collection of contextual data*. Countries would be requested to submit two types of data, which would provide contextual information on educational facilities for the school studies.

- **Existing codes and regulations** – such as construction codes and standards, student capacity regulations for classrooms and schools, space standards, comfort and health norms, security regulations – and **government initiatives concerning educational facilities** (*e.g.* projects that would result in life-cycle savings or energy conservation) that are *quality enhancing*.

- **Annual data collection**, preferably at the national or regional levels, on specific aspects of educational facilities. These data, which represent a facilities inventory, would be complemented by existing OECD education statistics data on demography, educational finance, enrolments, graduates and school personnel (see *Education at a Glance,* 2004 or *www.oecd.org/edu/eag2004*). These data could include, for example, *number of educational institutions* (by type of institution (public, private) and level of education (ISCED 0 – 6)); *enrolment in educational institutions* (*i.e.* number of educational facilities, by total school

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enrolment (in full-time equivalent) category and level of education (ISCED 0 – 6); *availability of educational facilities* (*i.e.* number of educational facilities, by facility category 1 (core, student support, teacher support, technology support, athletic support) and level of education (ISCED 0 – 6); *space in educational facilities* (*i.e.* total gross area of educational facilities, by facility category 2 (teaching, non-teaching, multi-purpose) and level of education (ISCED 0 – 6); and *age of core educational facilities* (*i.e.* number of educational institutions, by date of construction of core educational facilities, by construction period and level of education (ISCED 0 – 6). Countries would be requested to provide the source(s), methodologies, data collection period and the school year to which these data refer.

Short-term considerations

The following issues relating to a proposed international activity must be considered in the short-term:

- The relevance of the principles, focus questions and methodologies discussed at this meeting to non-OECD countries.

- The development of a matrix or organising framework that demonstrates the relationships between the principles and focus questions outlined in this report, educational policy, educational facilities design and evaluation methodologies.

- The prioritisation of quality principles by the PEB Governing Board countries to guide the Programme on Educational Building 2007-2011 mandate. Member countries may be asked to rate the policy relevance, feasibility and cost of developing activities in one or more of the quality principles using one or more of the discussed methodologies.

- Placing "quality" in educational facilities in the OECD indicators organising framework (Annex 2).

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ANNEX 1
EXPERTS ATTENDING THE 1ST AD HOC EXPERTS' GROUP MEETING ON EVALUATING QUALITY IN EDUCATIONAL FACILITIES, 1-3 JUNE, LISBON, PORTUGAL

Allen Abend is an architect and Deputy Director of the Maryland Public School Construction Program. He was a key leader of the Maryland Task Force to Study Public School Facilities that conducted a 10-month assessment of nearly every public school building in Maryland. The survey evaluated building conditions and capacity in 1 342 schools, as well as each building's ability to support educational programs and support services. 31 fundamental elements, or minimum standards, were developed and grouped into four categories: building and site factors, student capacity, education programs, and support services. The survey also estimated the costs to bring each building up to the standards. The Task Force considered the approaches to school facility assessments taken by several other states, including Arizona, North Carolina, and Ohio.

Rodolfo Almeida is an architect of Mexican nationality. Since 1998, he has been an international consultant on architecture for education for UNESCO, and regional consultant on educational spaces for the UNESCO-Santiago Office. Before that time, he was Director of the section responsible for co-ordination of all the educational building and furniture projects of UNESCO. Has worked in the field on more than 90 countries, in all aspects of research, planning, design and construction of educational buildings. He is a member of the Working Group Educational and Cultural Spaces of the UIA, and Council of Educational Facilities Planners International (CEFPI).

Emmanuel Baltas was Managing Director of the School Building Organisation (OSK) in Greece from 1997 to 2004. He is a civil engineer and a graduate of the Athens National Technical University School of Engineering. He has been involved in many national and international programmes and initiatives in the area of school construction, including the OECD Programme on Educational Building (PEB), the Board of Directors of the Centre of Hellenic Public Enterprises and Organisations (Vice Chairman, KEDEO) the Ministry of Education and Religious Affairs committee in Greece for "The School of the Future"', and the Association of Chief Executive Officers (EASE). In 2002, he was elected city councillor for the Athens municipality.

Kenn Fisher was Deputy Building and Estates Officer at the University of Adelaide and later head of the educational planning and design division for the international architectural firm Woods Bagot. Mr Fisher now consults as a specialist in campus masterplanning strategic architectural briefing, acting as the prime interface between designers, teachers and students to co-create learning environments for new and emerging teaching, learning and research paradigms. He has been engaged by universities in Australia and overseas, over a dozen vocational training and community college clients, a number of State and National Government Ministries of Education, school organisations and other Government and corporate bodies. As a research fellow with the University of South Australia, his research interests include spatial literacy and how this can be sustained through student voice.

José Freire da Silva graduated as an architect from the E.S.B.A.L. in 1976. After a few years in the private sector, in the Sports Directorate and in Educational Resources at the Ministry of Education - where he worked on school programming under a World Bank Programme - he worked in Macao in

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the Urban Department of the Public Works Directorate, in the Municipal Technical Services and as an assessor for the Mayor of the City of Macao in 1993/94. Since 1994, Mr Freire returned to the Ministry of Education where he has worked in the Department for Educational Resources Management (DEGRE), which became the Ministry General Secretariat Educational Facilities Division, in Lisbon. He is founding member and was Vice President of the Macao Association of Architects (AAM), delegate to the UIA Congress and ARCASIA Councils, and was member of the Macao Heritage Committee and Macao Lands Committee.

Jaime de la Garza Reyna is an advisor to the Minister of Education in Mexico (SEP). Mr de la Garza's other professional experience includes serving as Technical Secretary for the General Director of the Administrative Committee of the Federal Programme for School Construction (CAPFCE) and also as an advisor for the Undersecretary of Planning and Coordination (SEP). Since qualifying as an architect at the Iberamerican University (UIA) in Mexico City, he has been involved in a number of architectural projects, at both national and international levels. He has participated in damage assessment meetings with the National Institute of Anthropology (INAH) as part of the Natural Disaster Fund policy (FONDEN), and recently participated in the first meeting between designers and planners of educational infrastructure sponsored by CAPFCE. Mr de la Garza Reyna has also participated in a number of PEB events, including "The Multifunctional Classroom" in Galway, Ireland in 2002 and the "International Conference on School Safety and Security" in Paris in 2003.

Teresa Heitor is associate professor of architecture in the Civil Engineering and Architecture Department, Instituto Superior Técnico, Portugal. She specialises in architectural morphology, particularly space-use analysis. Her research has included work on the spatial structure of buildings and urban areas and on how people relate to space in built environments. She is currently involved in a research project related to learning environments in Portugal. The project concentrates on both the survey of the existing 2nd and 3rd grade elementary and secondary school building types and the development of a school specific space-use analysis tool.

Christian Kühn completed his studies at the Technical University of Vienna (Dipl. Ing.) and at the ETH Zurich (Dr.sc.tech.). He has been a lecturer at the Institute for Architecture and Design at TU Vienna since 1989, holding a Venia Docendi from 2001. Professor Kühn is currently Chairman of the Curriculum Commission at TU Vienna. His research areas include design theory, computer-aided architectural design (CAAD), didactics of architecture and e-learning. He is author of a number of publications, including books on Adolf Loos (*Das Wahre, das Schöne und das Richtige*, Vieweg 1989) and Anton Schweighofer (*A Quiet Radical*, Springer 2001) and journal articles (*Architektur und Bauforum*, *ARCH+*, *Architecture d`aujourd´hui* and *Daidalus*). He is also an architectural critic for the Austrian daily *Die Presse* and Chairman of the Austrian Architectural Foundation since 2000.

Larry McEvoy is a chartered quantity surveyor by profession, and a procurement specialist. He worked in the private sector as a chartered surveyor for 18 years before moving to the Planning and Building Unit of the Department of Education and Science, Ireland, in 1996. Since then, he has been involved in all policy areas relating to school buildings, including preparation of technical guidance and procedural documents. He was also involved in a detailed design study to produce a generic exemplar type primary school building. The first of these schools is currently under construction. Mr McEvoy has been professional and technical manager of the Planning and Building Unit, which oversees the school building capital programme in Ireland, since July 2004.

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Peter Mortimore is the Former Director of the Institute of Education and Pro-Vice-Chancellor of University of London. He has conducted research in fields of school effectiveness and school improvement, and is the author of several publications including *Understanding Pedagogy and its Impact on Learning* (1999) and *Improving School Effectiveness* (2001). Professor Mortimer was Director of School of Education at Lancaster University from 1988 to 1990, Assistant Education officer for Secondary Schools at Inner London Education Authority (ILEA) from 1985 to 1988, and Director of Research and Statistics at ILEA from 1978 to 1985. He was President of the British Educational Research Association between 1999 and 2001, and is currently a consultant for the OECD on Danish and Norwegian School Reviews.

Lutz Oertel is a social scientist with a PhD from the University of Konstanz in Germany. He has worked in the Education Directorate, Zürich canton, since 1971. His three main research areas in educational planning and innovation are restructuring compulsory education in upper secondary education (grades 7 to 9); school site management and quality development (he participated in the International Network of Innovative School Systems); and reforming the compulsory school system as a whole, including introducing new legislation. Mr Ortel has been involved in school building planning at the local level. He is currently organising research projects in the field of communities' school systems (*e.g.* educational administration and school leadership).

Rosa Oliveira Melo da Silva graduated as an architect at E.S.B.A.L. and worked as a Senior Officer (architect) in the Ministry of Education in Portugal from 1980 to 2004. During this time, she was involved in the planning of school networks, analysis of trends in the Portuguese education system, and establishment of norms and regulations on educational spaces. Her current roles and responsibilities in the Inspectorate of Education include co-ordinating an appraisal on the development of a safety and welfare culture in schools, auditing an evaluation of the quality of educational facilities, and designing and implementing a training course on the quality of space and safety in schools.

Sheila Walbe Ornstein has been a professor at the School of Architecture and Urbanism at the University of São Paulo (FAUUSP), Brazil, since 1980. She was also head of the Architectural Technology Department (1995-1998) and Vice-Dean (1998-2002) at FAUUSP. She is also a senior researcher and co-ordinator of the Post-Occupancy Evaluation (POE) programme at the Research Centre on Architecture and Urban Design Technology, University of São Paulo (NUTAU-USP). Much of her POE research has focused on school and work environments and facilities, as well as housing and outdoor environments. Her research and teaching interests include the study of construction technologies. She has been a senior researcher at the National Council on Scientific and Technological Development (CNPq, Brazil) since 1999, and a member of the Environmental Design Research Association (EDRA, USA) since 1989. Professor Ornstein has more than 100 publications.

Luís Manuel Pacheco graduated as an architect from E.S.B.A.L. in1976. He is currently an assessor in the DREL - Lisbon Regional Directorate for Education, Ministry of Education. Mr Pacheco was a jury and committee member for the "Dili-Lorosae Portuguese School" (2004) and a ministry working group for programming secondary schools member (2003). He participated in the Sintra local authority committee for public competitions for new basic schools. As DREL architect, he has been the author of many project renovations, extensions and new schools from 1995 to 2004, including a project for basic schools in 1991, and has revised school building prototypes used by the Ministry. He is representing the Ministry at the "Macau Portuguese School" committee this year. Eighteen schools have been constructed or are being constructed under his projects and guidance.

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Joaquim Alves Pereira graduated as a civil engineer at IST in 1971. He then worked in a private project company, Profabril, as a project engineer in Paris, in Housing Development (eight years) at FFH (Fundo de Fomento da Habitação), in school planning at DGEE (School Facilities Directorate at the Ministry of Education) and in quality at DGQ (General Directorate for Quality). Since July 1985, he has been working in Évora on projects related to school buildings in different entities of the State. He is currently head of department at Direcção Regional de Educação do Alentejo (Regional Directorate of Education for Alentejo) responsible for schools works and projects, and schools preservation.

Claudia V. Tamassia is an assessment specialist with masters from the University of Missouri-Columbia and PhD in educational psychology from the University of Illinois in Urbana-Champaign. She worked at the OECD from 1999 to 2004 on the management of the Programme for International Student Assessment (PISA) on issues of implementation and dissemination. She has also worked at the Ministry of Education in Brazil at the Instituto Nacional de Estudos e Pesquisas Educacionais (INEP) on implementing the national assessment of basic education (SAEB) and international surveys. She has been involved in PISA from its beginning, first at the national level from Brazil and later at the international level from the OECD. Her main interest is on student performance and its related variables.

Keith Thomson has been on secondment to the Scottish Executive since November 2003 to assist in developing a school estate strategy for Scotland. This work has involved the engagement of local authorities together with a wide range of other public and private sector stakeholders to develop guidance in a number of areas including (in collaboration with Chris Watson) the evaluation of school building projects. Keith's original background is in architecture, and he has more than 12 years' experience working in a local authority education department as a project manager developing briefs and managing school building projects in and around Edinburgh. He is also a member of The Education Design Quality Forum; a client forum set up by the Royal Incorporation of Architects in Scotland.

Sebastian Tombs is a Chartered Architect who worked in Philadelphia, United States, before settling in Scotland in 1975. His experience includes working in private practice, a community Housing Association, the Housing Corporation and Edinburgh District Council Housing Department. He is currently Secretary and Chief Executive of the Royal Incorporation of Architects in Scotland, having run the Practice arm of its activities from 1986 to 1994. In July 2005, Sebastian will take up the post of first Chief Executive of Architecture and Design Scotland, a new non-departmental public body established by Scottish Ministers as the champion for good architecture, design and planning in the built environment. Mr Tombs was founder (and is a past Chair) of the Scottish Ecological Design Association, and the Association of Planning Supervisors (now the Association for Project Safety).

Chris Watson is an architect who has conducted 100 Post Occupancy Evaluations since the early 1980s including schools, universities, banks, apartments, courts, banks, police stations, museums, military, petrol station, prisons and archives. In 2000, he advised PEB delegates at the Paris conference on Post Occupancy Evaluation and he runs www.PostOccupancyEvaluation.com.

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ANNEX 2
OECD EDUCATION INDICATORS ORGANISING FRAMEWORK

OECD education indicators, which are published each year for all 30 OECD countries in *Education at a Glance* (*www.oecd.org/edu/eag2004*), are presented within an organising framework or matrix that considers:

1. Actors in education systems or four "system levels":

   - Individual learners.

   - Instructional settings and learning environments.

   - Educational service providers.

   - Education system as a whole.

2. Input, process and output variables in the education system or three "domains":

   - *Observed outputs* of education systems and the impact of competencies for individuals, societies and economies.

   - *Policy levers and contexts* groups activities seeking information on the policy levers or circumstances that shape the outputs and outcomes at each level.

   - These policy levers and contexts typically have *antecedents* – factors that define or constrain policy. These are usually specific for a given level of the education system, but antecedents at a lower level of the system may well be policy levers at a higher level (*e.g.* for students in a school, teacher qualifications are a given constraint while, at the level of the education system, professional development of teachers is a key policy lever).

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The four system levels and the three domains can be summarised in a two-dimensional matrix as indicated in Annex Figure 3.1.

Annex Figure 3.1. Organising framework of OECD education indicators

	(1) Education and learning outputs and outcomes	(2) Policy levers and contexts shaping educational outcomes	(3) Antecedents or constraints that contextualise policy
(I) Individual participants in education and learning	(1.I) The quality and distribution of individual educational outcomes	(2.I) Individual attitudes, engagement, and behaviour	(3.I) Background characteristics of the individual learners
(II) Instructional settings	(1.II) The quality of instructional delivery	(2.II) Pedagogy and learning practices and classroom climate	(3.II) Student learning conditions and teacher working conditions
(III) Providers of educational services	(1.III) The output of educational institutions and institutional performance	(2.III) School environment and organisation	(3.III) Characteristics of the service providers and their communities
(IV) The education system as a whole	(1.IV) The overall performance of the education system	(2.IV) System-wide institutional settings, resource allocations, and policies	(3.IV) The national educational, social, economic, and demographic contexts