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LABORATORY DESIGN for TEACHING and LEARNING

Summary

This project aims to improve communications between clients, designers and end-users in order to place teaching and learning at the heart of school science laboratory design.

All the national guidance on designing, building and fitting out school laboratories and prep rooms is made available through the website and on CD. Interactive software enables both 2D and 3D images of science laboratories and prep rooms to be created by teachers and technicians so that they can discuss requirements more easily.

The project has been funded by Planet Science and the Royal Society, and is managed by the Association for Science Education. Its materials are free and available to all interested parties; see www.ase.org.uk/ldtl. The software was developed by 3T Productions.

The project

Communication between architects, designers and manufacturers, on the one hand, and science teachers and technicians, on the other, is essential for developing science provision for the highest standards of teaching and learning. This project aims to facilitate that communication by making all the national guidance available in one place and providing software that all can use and understand. It is important that architects and designers understand what is needed to make a good teaching atmosphere. The type of pupil benches and the placing of services are vital decisions, but so too are the standards of illumination and acoustics; even the height of the whiteboard and the colours of the walls influence teaching and learning. At the same time, teachers and technicians need to appreciate the constraints under which architects and designers work. Financial constraints may mean that the floor area for a laboratory is restricted, even in new buildings, and this can severely affect the relationship between numbers of pupils and the type and placement of pupil benches. Provision for preparation areas may also suffer.

Good laboratory design in schools involves the science department from the outset and ensures that teaching and learning is central to the design process. The practical experience of science teachers and technicians can help avoid costly mistakes in design, fitting out and subsequent upkeep. For example, installing too many fume cupboards, or the wrong type of fume cupboard, can place unsustainable financial burdens on the school in terms of health and safety testing and subsequent maintenance. On the other hand, installing too few fume cupboards will certainly restrict practical work in chemistry and thus restrict pupils' learning.

Other people are involved in the decisions affecting design in the science department, not least those who control the money. The project hopes that by providing the guidance and the wherewithal to easily display plans in 2D and 3D, all those involved will understand the problems that end-users face on the one hand and the constraints that decisions impose on the architects and designers on the other. Headteachers and governing bodies need to be able to see the results of their decisions in advance in order to get the best value for money as well as the best designs for teaching and learning.

Project management for new buildings or for refurbishments is improved if all involved understand other peoples' points of view. The guidance and the design software allow all to contribute to the new facilities. End- users are frequently happy with their new rooms if they have been involved from the outset. Finance needs to be planned carefully so that all aspects are funded appropriately. All too often, the major part of the finance is spent on building works and the main furniture while seemingly unimportant details are left with scant finance or none at all. A prime example is that of pupil's laboratory stools. If left out of the overall planning, and with little money left in the budget, the cheapest stools are purchased. These can be badly designed and/or be of poor quality. The result is that the circular steel legs can grind their way into the floors and brand new floors can be wrecked in weeks.

The software developed especially for this project provides an easy-to-use design tool that teachers and technicians can use to explore their ideas. It enables the traditional 2D design to be easily drawn out with a range of over 80 items of laboratory furniture and equipment available on drop-down menus. Not everyone can visualise what a 2D plan will look like, so one click of the mouse then renders the design in 3-D. An aerial view gives a good overall view of the design and the full 3D view can be rotated and manipulated at will to enable a 'walk-through' of the design. Once a range of designs has been considered, teacher and technicians can talk to the designers, and/or to those providing the finance, and show them exactly what it is they have in mind. When architects and designers need to talk about constraints, these can be shown on the same software.

Once the design has been created, it can be populated with pupils and teachers to show clearly what the design will look like in use. Those who plan and use laboratories and prep rooms will know that the distances between benches and other furniture are crucial to circulation, health and safety and even to the discipline of the class. This software therefore takes the guidance on such distances and creates a soft golden 'aura' around each object so that the distances can be easily checked. Areas where items are too close show up clearly as a brighter gold colour.

The design tool can be used to create designs for new laboratories or the refurbishment of existing laboratories. Different designs of pupil bench are available, from the normal rectangles and squares to octagons, circles and even teardrops. A range of objects are included to enable prep rooms and chemical stores to be designed as well, for example: dishwasher, fridge, freezer, still. Also included are health and safety 'objects' to ensure that this aspect is not overlooked at the design stage; such things as fire extinguishers, emergency eye wash and first aid boxes.

The 'object' benches come in different heights so that prep rooms can have higher benches to enable equipment such as fridges and washing machines to fit underneath. Laboratories that are planned to have practical areas and writing areas can have higher benches for practical and desk height for the writing areas. Inclusion is catered for by adjustable height benches.

The guidance for designing, building and fitting out science laboratories and prep rooms comes from the DfES, CLEAPSS and the ASE. These institutions have worked together to enable all their guidance to be made available through this project. In the process, the Building and Design Unit of the DfES have updated the main building bulletin in science (this update is available in electronic form only)

Publications available:

'Science Accommodation in Secondary Schools' Building Bulletin 80, (revised 2004), Schools Building and Design Unit, Department for Education and Skills (DfES), www.teachernet.gov.uk or www.ase.org.uk/ldtl

'Science Accommodation in Secondary Schools', Building Bulletin 80 (revised 1999), Department for Education and Skills (DfES), The Stationery Office

'School Laboratories for the 21st Century', Schools Building and Design Unit, Department for Education and Skills (DfES)

'Designing and Planning Laboratories', Guide L14, CLEAPSS School Science Service

Topic 6 'Laboratory Design for Health and Safety', from 'Topics in Safety', 3rd edition, Association for Science Education (ASE)

Other documents:

A range of other documents have been written especially for the project in order to support, summarise, or amplify the main guidance. The project documents are:

'Teaching, Learning and Laboratory Design'	ASE
'Stakeholders and Timelines'	ASE
'Science – Designing the Whole Department'	ASE
'Designing the Prep Room'	ASE
'The Chemicals Store'	ASE
and Case Studies 1—9	ASE
Vignettes 1—7	ASE

'Teaching, Learning and Laboratory Design' is the main project document, discussing each aspect of design from the teaching and learning viewpoint. The need for more than one teaching position is discussed, for example: one position, with services, for demonstration and another with interactive whiteboard for presentation and discussion. The other four project documents provide entry points to the official guidance and summaries of the points that they make.

The nine Case Studies tell the stories of how different schools have managed the design and build of new, refurbished or converted rooms. The Vignettes are short opinion pieces that aim to make all involved think about particular aspects; for example, the need for good quality stools.

Accessing the project software:

Copies of the CD have been sent, free of charge, to every secondary school and every secondary member of the ASE. They have also been distributed widely to design and manufacturing firms. The whole application can be freely downloaded from the ASE website: www.ase.org.uk/ldt1. However, this is a large file and only a broadband connection will be able to download it in a reasonable length of time. While stocks last, copies of the CD can be obtained from ASE Booksales (see below); a handling charge of £5 applies. Personal orders can be paid for by credit card. School orders may need to provide an official order number. To order from outside the UK, please contact ASE Booksales in advance.

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