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AUTHOR	Gorey, Ann
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ABSTRACT

School science laboratory planning and building are being required to address long-term educational and structural implications, e.g. the linking of school instruction concerning testing of chemicals and substances with commercial applications in the workplace. This report examines how school science laboratories can be planned for the future by paying attention to the educational, environment, and physical sustainability of their designs. Specific questions are proposed to help in the planning process and examples are provided of schools that have addressed sustainability issue from low cost/no cost to high cost options. (GR)

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SCHOOL SCIENCE LABORATORIES: PLANNING FOR SUSTAINABILITY

by Ann Gorey

Policy Adviser, Policy Development

Department for Administrative and Information Services, South Australia

There was a time when science laboratories were planned and built as stand alone facilities, with science encompassing a range of activities from general science to specialist physics and chemistry. Now there are new ways of thinking in which science is seen to link into the school's total curriculum, and sometimes to go beyond the school into the workplace. Science is now seen to link to technology, to the creative arts (art and graphic design) to health and personal development (including home economics and lifeskills) and to workplace training. Synergies between components of the curriculum and also between places for learning -- schools, higher education and workplace -- are changing the ways in which facilities are planned. An emphasis on student centred learning through discovery and experimentation, team work and co-operative learning as well as greater emphasis on environmental issues and on occupational health, safety and welfare are reshaping the internal environment and the management arrangements.

Changes now being accommodated include linking studies in physics to work being done in technology, e.g. using computer modelling to plan and trial a project before actually constructing it from materials. Another change involves testing and analysing chemicals and substances, and then linking this to commercial applications in the workplace -- in paint production, in food production and in management of environmental waste.

Schools have the opportunity to respond to new demands from industry where there is a need to train people in laboratory procedures for basic testing, including management and oversight of technology used for routine testing and recording of results. Also as workplaces are required to comply with legislated standards, higher order skills in occupational health, safety and welfare are required and training is essential.

Planning for sustainability

When planning school science laboratories the planners and designers need to address long-term educational and structural implications. To do so, they must look carefully at the educational, environment and physical sustainability of their designs.

Educationally sustainable

The team must work out whether the planning takes into account current ways of managing the school's science curriculum and whether the proposed plans will meet the needs of the curriculum and match ways in which students learn (team work, collaborative learning, self directed research). Planners and designers must ensure that the plans reflect current and future thinking rather than replicating past practices without questioning their current validity.

Ask: Does the proposed environment take into account the ways in which the students may want to work and the range of equipment they may need to use? Does it facilitate student centred learning, group work and use of a wide and diverse range of technology to support learning?

Environmentally sustainable

This area includes design features such as natural light and ventilation, and also the responsible management of chemicals and other waste.

Ask: Does this building make use of natural resources -- natural ventilation and light? Is there collection of rainwater, reuse of grey water, use of solar energy and management of chemical waste?

Is there scope to use recycled materials? Will the builder manage building waste?

Will this building meet the legislated requirements for a safe workplace, and will it meet recognised guidelines for safe and environmentally appropriate disposal of chemical waste?

Physically sustainable

Ensuring the building's "fitness for purpose" is an essential part of good design. Its compliance with legislative requirements and its flexibility to match and meet a range of learning styles must not be neglected. If it's an existing building, a survey should be undertaken to ascertain whether the building can be redeveloped satisfactorily -- or whether it needs to be totally refurbished or even relocated in order to meet new but essential requirements.

Ask: What range of activities have to take place and why have certain arrangements been used previously? Do teachers still need to address the whole class, or are students more able to direct their own learning? Is there a need to demonstrate, or can this be illustrated through use of computers or video?

Some questions to think about when planning a new or refurbished facility

Who should take **responsibility for identifying new trends** and directions and testing these ideas against the status quo -- is it an architect's responsibility, an education planner's role, the school's task -- or a team effort?

When designing new facilities, **does the school want to explore new relationships** and new opportunities or is there a good reason to continue with existing ways?

When refurbishing existing assets, how much attention should be given to retaining existing relationships -- and **when should effort be made to identify synergy** between disparate subjects and links to other areas of learning?

How far should the school go to adjust its curriculum and classroom management to **meet the needs of industry** and the workplace?

Is it possible to have an area which is general purpose -- and also able to meet specific needs of a technically demanding curriculum?

Is it better to have a place for theory and **group discussions separate from an area where experiments** with chemicals and equipment are used?

Is it possible to reduce the number of highly specialised laboratories and to **program times for practical work**? If this was done how would the users compare long term savings with the day to day need to plan more carefully?

Is it better to have **fixed furniture** for stability and safety -- or **loose furniture** for flexibility and adaptability. Or is it possible to combine both?

Does the **focus of the space** need to be on a person demonstrating "how to" -- or on learners finding out "how to" and why.

Should the **outdoor environment** be linked to the indoor laboratory -- or are there other ways in which appropriate links can be made?

What extent of provision should be made from the outset of planning to accommodate people with **physical disabilities** -- and what details are better left until a need arises?

How is **storage** best achieved -- and what specific requirements must be met when storing chemicals which are hazardous, flammable and combustible?

What design **standards** need to be addressed, and what additional information needs to be sought out before commencing design?

What process will be used to check details to ensure that **legislated requirements** have been met appropriately?

Has a **staff familiarisation** and induction program been planned to ensure the users know what has been provided, how it was envisaged it would be used and how it can be adapted to meet individual preferences?

Examples ranging from low cost/no cost to high cost options

Unley High School in Adelaide uses low technology to facilitate science learning. Computers are used to record details and for mathematical calculations, video to record and play back science experiments and hand held technology for on the spot recording of field work. The school has been able to enthuse students and operate student centred learning which allows quick and fast learners to be extended while slower students are given more time and better support to ensure they have successful experiences in science. Senior science teacher Alan Pepper has structured his students into self paced learning groups and has set tasks at a range of levels so that every student is able to achieve basic skills, and more able students are able to progress to more advanced work. The school has older style classrooms, but by using moveable tables and a wide range of easy to use technology, the teacher has been able to create a dynamic learning environment.

St Peter's Boys School

This school has an extensive new centre which has been designed to take into account the need to demonstrate ecologically sustainable development, the principles of natural lighting and the flexibility of new designs that allow for a number of different options. Science and technology are linked so there is a clear connection between these fields of knowledge. Features of the new buildings include recycled water, solar energy, site orientation, and linking of indoor and outdoor areas.

Prince Alfred College

The school has a purpose built technology centre -- the Clipsal Centre -- funded by old scholars whose family business is in electrical appliances. The technology centre is linked to the science facilities that allow for computer modelling and experimentation, before proceeding with materials and manufacture of the designs. In this school there is a strong emphasis on linking the theoretical with the practical and each year there is an event in which model solar cars compete. The school also has a solar powered boat.

For further information contact Ann Gorey, email: gorey.ann@saugov.sa.gov.au.

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