

CP906: Integrated Workshops: Designing environments

Abstract

Reference: CP909

Title: Integrated Workshops: Designing environments that foster imagination and spark a creative fire

The classic wood and metal workshops have served well, catering for the acquisition of practical skills in a methodical and predictable manner; however, times change. These environments were designed for the needs and processes of more than half a century ago and the subjects they were designed to facilitate and enable have since undergone a huge metamorphosis.

And so Technology HoDs throughout New Zealand are left to ponder some key and very practical questions:

- how much should schools adapt the subject of Technology to accommodate the limitations of legacy environments?
- how can schools effectively adapt these environments to accommodate this new subject and its specific needs and teaching and learning approaches, particularly when being assessed under the Achievement Standards?
- how can these adaptations be made in a practical and cost-effective way, that will key-in to possible future rebuilds of the Technology teaching environments?
- when is adaption not enough, and new purpose-built areas become essential?

This case study examines how Matthew Lane led the change of the 40-year-old workshop environments of the Wellington College Technology department during 2003-2008, through a set of staged adaptations that culminated in the completion of the first stage towards a fully redeveloped Technology block.



[Wellington College Technology Block upgrade Before and after gallery](#)

The issue

Matthew Lane first arrived at Wellington College in 2003, fresh from teaching GCSE Design and Technology and AS and A2 levels in the UK, he was confronted with many practical health and safety and design environment issues. He describes the two workshops he had to teach hard materials in – T2 for wood working and T8 for metals – as "large, spacious centres of noise and dust".

"Machines that should have been long-since relegated to machine rooms for technicians, were still in the workshops. When in use, these machines rendered teaching/instruction nigh on impossible. Circular saws, buzzers and planer thicknessing machines were in the same environment as student work-benches, something I hadn't seen for 15 years. Indeed the use of bandsaws and routers by Year 10s was a restricted practice in the UK. Hand-held metal grinders were used by students in close proximity to others cutting with handsaws and there seemed to be little chance for anyone to have any reprieve despite multiple numbers of ear-protectors deployed to cushion the blow."

"Noise was one problem but dust a harder culprit to pin down – while the extraction system was good and removed the majority of dust, a thin layer could always be found settling uninvited."

To do online research and graphics work, Technology students (and staff) had to book computer rooms over the other side of the school. "It was best described as a free-for-all. The Library was used for research and development but was often used for more the three classes simultaneously and management of the Technology groups were a constant problem."

"The more I delved into the New Zealand Technology curriculum, the greater my concerns became about the environment in which my teachers and I were being asked to deliver it. What I was being asked to teach and deliver and the opportunities I was required to offer my students did not match the restrictive environment that we were all given."

In talking with students and staff, there was clearly frustration experienced by all when trying to produce quality Technological problem solving on a workbench with vices, dirty surfaces and no leg room. "The students came eager to 'make' and 'manufacture', and I set the scenarios, discussed stakeholders and reviewed potential problems. It was a time of frustration and disappointment to all. I surveyed several of my classes and their response was unanimous: 'If you want us to design and problem solve, then give us computers, books and flat surfaces'."

Matthew decided to lobby for major changes to the working/teaching spaces for Technology in the school. His resolve was strengthened by the advent of the Beacon Practice project, for which he successfully applied and Wellington College joined as a member of the Wellington cluster group.

"The Beacon project provided a platform to launch a successful bid for increased funding and expenditure on Technology," Matthew says.

"Through this initiative I was able to enlist key Professional Support Facilitators to confirm my proposals and apply their experience to the problem solving and decision making required, which in turn helped give substance and weight to my presentations."



Hand-held metal grinder use amongst workbooks and bags



A room of workbenches and vices – no quiet areas for research and planning, no surfaces for drawing and modelling.



Edward Wiley consulting with landscape architect Rebecca Wilson

Stakeholder buy-in

The senior management team supported a physical upgrade to the department. Significant finances would become available in 2008/9 and then more in 2013, so a two-tiered approach was envisaged; stage 1 in 2009 and stage 2 in 2013. The department was overdue a major overhaul – the last major changes having been made almost 40 years before. However, this alone was not sufficient to guarantee spending – temporary measures had been implemented in the department in the past and could well suffice again if a clear strategy was not forthcoming. The Board of Trustees, principal and senior management team would need to be convinced of need for change to accommodate both the present needs of the department and the direction the subject of Technology could be taking in the future.

The first step for Matthew was to analyse the current state and future requirements of the department, from every angle. He undertook:

- a major audit of the existing equipment, machinery, furnishings and health and safety;
- the tracking of current usage of specialist rooms and an evaluation of the use;
- an analysis of the specialist material areas the department was currently unable to offer and an assessment of their worth; and
- an audit of the specialist competencies currently available by staff and the identification of any shortfalls.

Keen to find out what solutions other big technology departments had come up with, Matthew gathered examples from around the country of successful Technology teaching environments (many in Beacon Practice schools) and identified their key features. During 2005 he visited a number of schools, including Auckland Girls Grammar (where 'pods' of specialist activity were being used) and Havelock North High School (see photographs of the Technology Block in the gallery on the right). He was particularly impressed with Havelock North's new graphic studios that had been designed with ICT as the first and central aspect of the studio.

Once the current position and future possibilities had been examined, Matthew developed a presentation for the Board of Trustees, through a sub-committee and senior management team to get their approval of the scope and direction of the upgrade. This was an opportunity for Matthew to not only underline the importance of Technology to the school, but to challenge the thinking around what constituted ideal learning environments.

"The subject of Technology is uniquely positioned to offer students a broad range of experiences that explore the reasons why and how and solve pertinent problems in a range of dynamic forms," he says in his presentation. "Creating an environment that is functional and stimulating, modern and futuristic is our challenge – one that we need to rise to and be inspired by. This upgrade is an opportunity to make a different statement about the culture of the school environment."

Matthew presented to the Board a [Department Overview](#) (PDF 430kb) which included a full stocktake of the current physical set-up of the department. In terms of rooms these were summarized as:

- T2 – a wood-orientated workshop with timber store, project store, and polish area/small fan;
- T3 – a metal-orientated workshop with metal racks, heat bay and project store;
- T3 – a graphics room with Smartboard, projector, and eight computer workstations;
- T5 – a graphics room with projector and eight computer workstations; and
- T4 – an office with four workstations for staff, and storage units for documentation and graphic equipment.

Key elements of Matthew's presentation included his wish to change the style and configuration of the workshops, to become multi-material settings where a range of materials could be explored and utilised. "We have made significant steps away from the old 'Woodwork and Metalwork' mentality," he says, "and now need to capture the problem solvers, innovators and environmental thinkers of the next generation." He suggested that the machines that were 30-40 years old be rationalised and replaced on a rolling programme with [computer numerical control](#)



Havelock North Technology Block
[Open gallery of images](#)

Matthew was influenced by the pods for specialist activity he saw at Auckland Girls Grammar.



On the right are pods, on the left the workshops, and above right are the first floor staff area and resource rooms on the left graphic rooms.

(CNC) machines, and that the workbenches were also ready for a similar programme. "We live in a microchip/precision world and yet teach with tools from an era when there were no computers. It would be like teaching Computer Studies with the old, first-generation BBC computers," says Matthew.

A rethink of the layout and organisation of the entire environment, both within each workshop, and the support and entry areas, was required. Machines, for example, should be moved to one end of each workshop, and at the other should a dry area for design and modelling that provided students with facilities for 3D experimentation. Critical to the new environment would be the incorporation of new graphic studios situated close to both workshops – a computer suite of 30 machines and related hardware was needed, he says.

Taking a lead from Havelock North, where the Technology block has a distinct presence within the school, Matthew was also keen to create a foyer leading into the Technology block, with project display areas in the inner transit areas, and, in the future, interactive computer screens (for students to access information and exemplar work) for this area and visual displays projected upon glass panels, that could embrace not only Technology but Science as well.

In this initial presentation, Matthew also took the opportunity to open minds to the possibilities of broadening the subject base on Technology in the school, which offered the traditionally male subjects of Graphics and Hard Materials, and ICT via a separate department. "Should Wellington College offer students a 'Food and Nutrition' course with perhaps a focus upon hospitality and catering?" he asked. "A small but significant number of students do work in this industry – some for short periods of time, others for longer."

He also mooted the idea of offering a textiles/fabrics/fashion course. "These areas were meshed into the design suite of subjects offered in Technology Faculties I have worked in, within schools that were smaller than Wellington College. And, of course, textiles is a central factor in the design and implementation of product design – think of all things related to seating for example." For good measure, Matthew also tossed in the idea of incorporating an ICT Control / Electronics environment "one shared perhaps with Science where an increasingly electronic world is encountered and explained, and typical problems and solutions to everyday life can be investigated and explored."

Matthew felt it was important to aim high, and to present, along with important fundamental changes, the seeds of future possibilities that the changes he advocated could/should open up "With any proposed changes," he says, "I would like to suggest we consider some form of alternative energy plan, such as solar power. We have vast expanses of roofing which might not be available for Government subsidy but which will be a long-term investment sure to pay for its initial outlay within eight years. This may be considered beyond our brief, but if we in Technology cannot raise the issue who can?"

Matthew also brought up the issue of gateway practical apprenticeships. "Notwithstanding all the above, there is a need for students to learn how to construct and work within the building industry" he says. "What may be offered on a preparatory basis is a foundation course for such industry led programmes. The facilities for such a venture need to be planned. By nature the activities will resemble building site experiences and planning for such is key to the success of such an environment."



The lockable pods for controlled access and supervision.

Establishing targets

Having received a positive response to his presentation of "grand proposals", Matthew turned his attention to developing a practical managed scenario with long-term, medium-term and short-term goals.

Matthew debated the changes with the department team, who had input throughout the process. He then asked Technology consultant Cliff Harwood to review the environment with him and the school's property managers, which resulted in a refined proposal. Other Beacon Project facilitators were consulted for their advice and expertise. The College's maintenance team was consulted throughout to find out what was viable and within their remit, especially regarding the interim proposals.

The senior management team was involved with discussion about maximum class sizes and limitations regarding space in the new design areas, which led to a decision to cap class sizes. Student groups were surveyed concerning seating needs and design space, and the opinion of other subject staff was sought concerning their perception of classroom space. Projections of growth in Technology and Graphics were plotted and used in the planning.

"An analysis of the environment clearly showed sufficient space for modifications that would enable the creation of a design/research area without compromising workshop space. Machines had to be rationalised and some judgment made concerning what to keep and what to sell."

The end result was a proposed timeline for the upgrade:



Victoria University Design School mentor in consultation with Owen Nicholson amongst the workbenches

	Planned	Completed
Short term projects		
Provide flat surfaces in the workshops for students to work on	2005	2005
Build several portfolios of laminated exemplar material	2005	2006
Equip workshops with modelling facilities	2005	2005
Resolve leaking roof problems!	2005	2007
Develop Smartboard usage in Graphic area	2005	2005
Medium term targets		
Create resource facilities in both workshops	2007	2008
Create display areas in both workshops	2006-7	2007
Extend display facilities in Graphic rooms	2006-7	2006
Purchase new machines/equipment e.g. sand blasting	2007	2006
Mount projectors in all rooms for use with laptops	2007	2007
Increase computer facilities in the department	2007	2007
Long term Objectives		
Increase workshop areas from 2 to 4	2009-10	2009-13
Develop 'pods' of specialist activity including laser cutters	2010	2009
Create an electronic /fabric area	2010	2009
Develop a Food Technology facility	2010	–
Fully rationalise machines - Sell old stock purchase new machines	2010	2008-9
Create design studios adjacent to workshops	2010	2009
Increase storage areas in the department	2010	2007-13
Develop a permanent display area for 3 dimensional work	2010	2009
Partition the heavy dust/noise producing machines off from workshops	2010	2009-13
Develop CAD/CAM facilities in both workshops	2010	2009-13

"Having been successful in our bid to have the department restructured we had to weigh what would be practical and what could be put on hold. Some of the short-term measures were simply that, temporary solutions and stop-gap measures that met the immediate need, such as the drawing boards in the workshop. Others, like the roof, required extensive funding and planning and there were no quick fixes, instead buckets and bins would be strategically placed. Short- and medium-term targets had to be measured in the light of long-term planning. The key question was, 'Will we have to 'undo' anything?' – all interim changes had to be thought-through and be genuine steps towards the long-term changes, and be beneficial to all."

Implementation

Most of the short-term targets were implemented during 2005/2006, and many medium-term ones instigated during the 2006 summer holidays and largely completed during the first term of 2007.

Display area and resource library

The first change was the creation of a design/research area at one end of each workshop. "Displaying student work and providing an environment where students might be stimulated to think creatively, has long been one of my personal goals."

The areas were situated near the entrance to each workshop and were set up without compromising workshop space. They included normal desks and seating for 24, a library, display areas, and whiteboards. Projectors were placed in the Graphic rooms and used extensively, and were not housed in the workshops until the heavy machining areas had been partitioned off.

For the displays, the aim was to exhibit quality student work – both former student's work and current portfolios – and work by professional designers. Displays could be themed and rotated, featuring different groups as they progressed through the year. The long-term plan was to have interactive display consuls that students could click on and view previous project work and related websites.

Matthew instigated a book-buying campaign to purchase 'top end' design and technology books through Gordon Harris. "Graphics was reasonably well catered for in terms of resources and materials, but Technology was significantly lacking – books were between 10 and 40 years old, in poor condition, unappealing and failed to address the technological process, design function/aesthetic issues, product design, client interaction, modelling and numerous other subjects."

The area was an immediate runaway success. "The display of work and selection of modern visual stimulation dramatically altered the ambiance of both rooms," said Matthew.

"Department staff use the area to engage discussion, debate key words and explore alternative ways of problem solving, and students are increasingly turning to it as a source of ideas and motivation. There is a heightened awareness of the need to discuss function versus aesthetics and mesh these attributes with client preferences and environmental sustainability."

"This success clearly demonstrated to me the need for fully-equipped design suites within the working environment of a technological area, to enhance student understanding of the subject as a problem solving experience, using a wide variety of materials and media."

A new computer suite

In another hugely beneficial move, an old archive storeroom between the Graphic and Technology rooms was converted into a computer lab. Computers were first installed on a trial basis, but once it was demonstrated that they would be maintained and the area supervised, more were provided, to total 18 in all, and the existing computers changed for ones with higher specifications to manage the newer graphic programs. The computers were bookable for the department and then subsequently the rest of the college.

Other workshop changes

Both workshops were overhauled and equipment rationalised. The roof was fixed – buckets and bins were no longer required when it rained.



The design area in T8 Metal Workshop seats 24 students



Computer suite – 18 workstations.

The new Technology block

With the short and medium term goals achieved, in 2008 it was time for the implementation of the long-term goals through a complete redevelopment of the Technology Block. An architect used by the college to design the new Language block was commissioned to work with Matthew to develop the plans for the proposed major upgrade planned for later in the year.

Consultation with all stakeholders continued to be vital throughout this year, says Matthew. "2008 was a year of many meetings and multiple presentations that sought to communicate with a wide and varied audience the perceived needs of the department and how they were planning to address them."

During this time Matthew found that the changes that had already been put in place had created a fundamental shift in attitude towards the subject of Technology, creating a new vision and a re-evaluation of the subject both within the department and from the rest of the school.

"Matching the interim changes with the Department's development plan was highly effective in explaining and demonstrating the ethos of Technology, and helped change the view of the subject within the college.

The displays and design stations in the workshops had begun to break down the 'old' stereotypical image of wood and metal workrooms."

The redevelopment would comprise:

- The creation of a new workshop purpose-built to deliver Gateway projects and new courses. The shortage of workshop space had been identified as a major issue. New Courses such as Gateway clashed with existing Technology classes and required workshop space to expand.
- A design and creation of a new entrance to the Technology block that 'sets the scene' and impresses, including the creation of a courtyard and the development of an entrance foyer, and display cabinets for student work in the foyer, corridors and workshops. This objective was fundamental to all that Matthew visualised and aimed to elevate student and parent perception of Technology. "I wanted to exhibit work that would engender feelings of excitement, wonder and desire, proclaiming that Technology was a vibrant subject and one worthy of attracting the best students in the College," said Matthew.
- Extending the computer pod from 18 to 30 stations. Matthew's intention was to have direct access to a full complement of computers, enough to meet the needs of one full Graphics class.
- Creating new pods of specialist activity, including:
 - a ceramic chip forge/brazing hearth pod;
 - a laser cutting pod;
 - an enamelling and plastic heat treatment pod;
 - an aluminium casting pod; and
 - a spray booth and extraction pod.
- The introduction of pods has many benefits: activities are focused in one area and can be closely monitored, other students cannot easily interfere, safety is enhanced and demonstrations can be performed to several students standing behind the glass, outside the pod. Fumes and heat can be limited to specific areas and noise can be reduced.
- Partitioning off the heavy machine areas in both workshops using workshop-wide sliding doors, heavily insulated to reduce transmission of noise and dust. This was to be part of a major overall objective of sound-proofing the noise-making technological activities to create an integrated environment where multiple activities could take place – designing, modelling, machining, testing and evaluating.
- Developing two new design/modelling workshops as predominantly dry areas.
- Installing ceiling-mounted projectors in all workshops for laptop use. These had long been an integral part of the development plan, but could not be installed until Matthew could guarantee the reduction of dust.
- The design and development of new multi-material workstations that facilitated easy transition between wood/metal/plastics/electronics. Changing from one media to another could be achieved quickly with the right systems and purpose-built furniture in place. Matthew sought out and tested existing solutions and prepared detailed specifications for these workstations to be assembled locally to order.
- Designing and installing new tool storage facilities/display including secure, lockable cupboards with easy referencing of hand tools and specialist equipment.
- The development of new storage facilities for project work, with both ease of access and security, designed in modules to provide multiple spaces of varying sizes.
- Creating a new department staff office, to achieve greater prominence within the department and with the space required for staff forums.
- The allocation of space for interactive displays, to be part of a future budgeting round.
- Graphic rooms to be re-equipped – although not a part of the main infrastructure change, this remained high on



[Click for larger view, before and after](#)

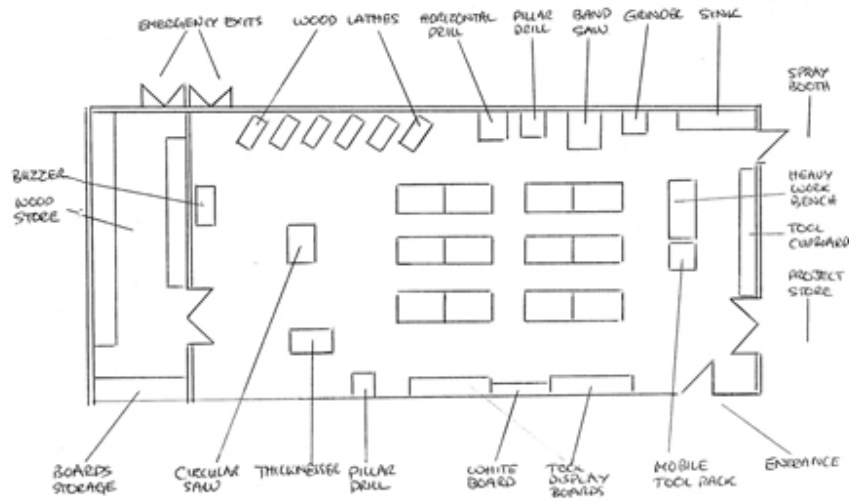
the agenda.

[Original floor plan](#)

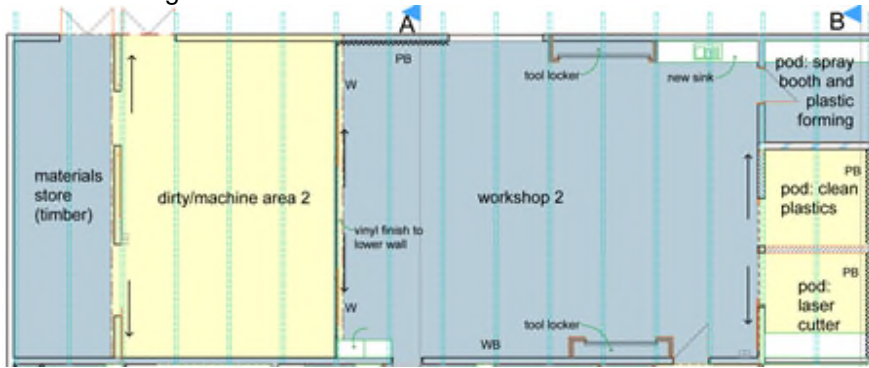
[Updated floor plan](#)

Room T2 – Wood workshop: (click image to enlarge)

Original setup

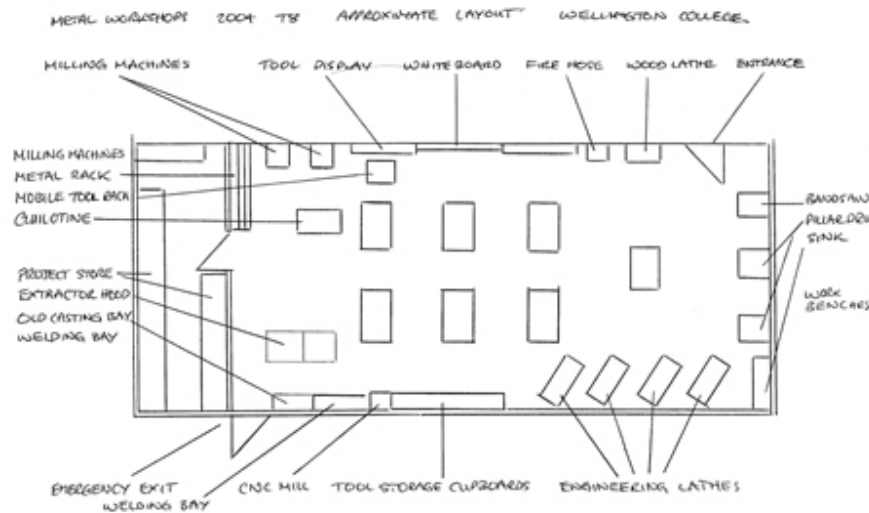


Planned changes

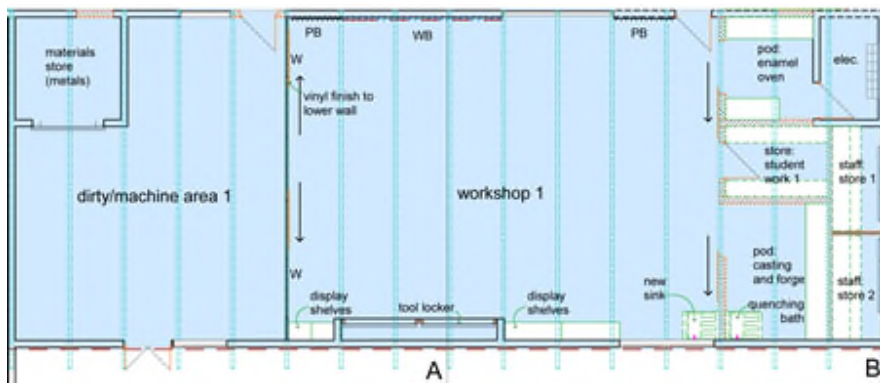


Room T8 – Metal workshop: (click image to enlarge)

Original setup



Planned changes



Outcomes

By mid 2009, Stage 1 of the [Technology Block upgrade](#) has been completed, which includes a new entrance way, the complete upgrade of the T8 metal workshop, and the conversion of the former maths room T6 into a multi-material workroom, the results of which can be seen in the [gallery](#). Stage 2 will be completed in 2013 and will include the complete upgrade of the T2 Wood Workshop and the Graphic rooms and more storage facilities.

"The new purpose-built workshops and the other changes have significantly improved the school's capability to deliver the new requirements of the subject and to deliver Gateway projects and new courses," says Matthew.

"Perhaps more than any other subject, the environment in Technology sets the 'tone' for a student's perception of the subject. The alterations we made to the department, even early on, have made a huge difference. When students walk through the entrance foyer, down the corridors lined with displays of student work and into the workshops where the first thing they see is the research/design areas, then they appreciate Technology as an innovative, problem solving, multimedia experience. The numbers opting for our courses rose as soon as even the interim changes had taken place."

The use of the projector and staff laptops within a workshop setting have been particularly successful, says Matthew, enabling a wealth of demonstrations and exemplar work from a variety of sources to be immediately available to motivate and inspire the students both in class discussion and one-on-one. "The use of this technology by students to demonstrate some of their problem solving work or perhaps show alternative solutions to peers will be equally worthwhile. No longer is the workshop simply a dusty noisy environment, but a multifunctional creative space that supports all stages of technological development work."

"The overall impact of the changes to the department has been stunning and students and staff are thriving," says Matthew. "Having an environment that supports good technological practice – to conceptualise, review, model, test, modify, liaise and conceptualise again, in a cyclical manner – has greatly broadened student understanding of Technology and its processes. Their practice is continually being reinforced by the existence of dedicated spaces for each aspect of a project and by the ease with which they can move from one stage to another, and back again if required. There is a greater emphasis on the exploration of ideas and materials through modelling, principally as the result of the availability of the new multi-materials workroom. The environment now actively encourages the kind of exploration that makes Technology the unique subject that it is."

At the beginning of 2009, Karl White took over as HoD Technology and Graphics. He moved from his position as Deputy HoD, and so was involved throughout with the upgrade. "The new environment allows the student to explore, develop, refine, and research in a range of areas and mediums," he says. "Just having display areas for student work is changing the tone. The interest level and quality of the classrooms is setting the standard for students' own outcomes, which can only improve the awareness of our subject."



[Wellington College Technology Block upgrade Before and after gallery](#)