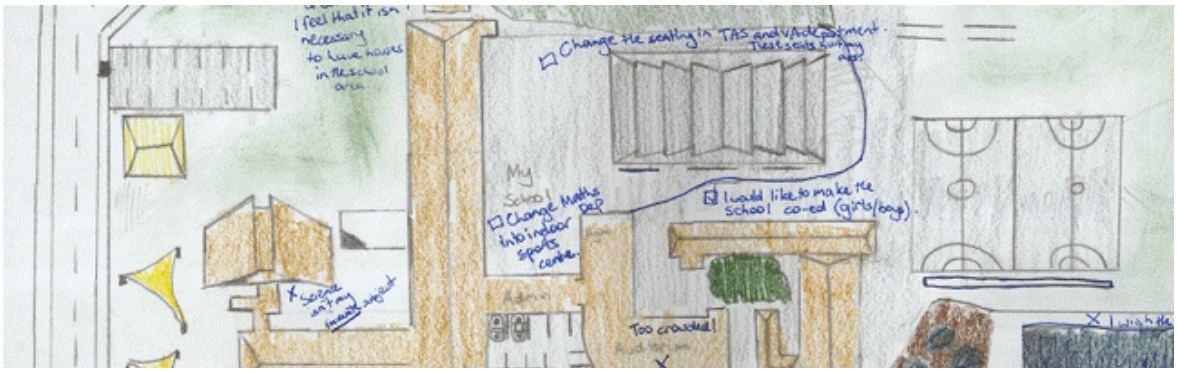
“They should fix the crack”:
Reflections on the built environment in the middle school years

Linda Corkery, Andre Grant, Ben Roche & Vivian Romero
Faculty of the Built Environment – University of New South Wales

2006 NSW Architects Registration Board Research Grant



FBEOutThere!

FACULTY OF THE BUILT ENVIRONMENT

UNSW THE UNIVERSITY OF NEW SOUTH WALES

Table of Contents

Executive Summary

This research project has sought to explore how and when students in NSW schools are being exposed to learning about and learning in the built environment through various Design and Technology (D&T) syllabi. The project was initiated by the NSW Architects Registration Board because of their interest in how "consumers" of architectural design are learning about the design process and about the products of design activity. Specifically, we wanted to learn how students in the middle years of their schooling thought about the built environment and the extent to which an understanding of the design process might influence their attitudes about the built environment – now and in the future.

The Built Environment stream is relatively new (introduced in 2003) and the degree to which it is being taught by teachers throughout NSW was another question the project sought to reflect on. Anecdotally, we knew that many teachers found this strand of the syllabus difficult to focus on, in comparison with the design of a specific object or product. We were interested to discover ways in which D&T teachers could be better supported in undertaking projects with their students that used, for example, the built environment of their school grounds and the immediate environment of the school community.

The project was structured around a number of key research activities that, in themselves, modelled ways for teachers to identify projects and approaches for developing learning and teaching activities in the context of the built environment. Our research activities engaged students in years 5-8, in 11 schools, to draw, photograph, and discuss their school and neighbourhood environments. Through this qualitative research process, we have developed our own snapshot of students' level of awareness, interests and concerns about their lived experiences of school and home environments.

An email survey of D&T teachers throughout NSW helped us to gain an understanding of some of the issues related to leading projects with their students that are based in the built environment. This was followed up with in-depth interviews with teachers at the same 11 schools where the students participated in drawing and photography activities. The interviews, in particular, highlighted the following important points:

- the role of quality learning processes to develop projects that are relevant to students' context and experience

- demonstrating how design thinking is a transferable skill that activates "big picture" thinking about built environments and is applicable to problem solving and project-based learning
- working with students to formulate built environment project work that is relevant to their experiences of their surroundings and grounded in their language, concerns and views of the world
- basing the work around *active* enquiry, eg researching one's own environment and proposing an intervention, as opposed to *passive* enquiry where a project is set in a theoretical context
- empowering students with a sense of personal agency to be creative and innovative, and a capacity to propose change through the design process
- providing a holistic framework for evaluating proposals from a sustainability viewpoint.

Through the activities we conducted with the students and their teachers, the report identifies a series of next steps to: 1) better engage young people in learning about the design process through the built environment, and 2) supporting teachers in constructing their learning and teaching activities within the D&T syllabus. These ideas include:

- use the built environment to support learning in other syllabus areas
- incorporate active investigations of built environment issues in students' local environments
- encourage a variety of learning activities and modes of communicating about the built environment
- foster an exploration of the built environment that is situated in school grounds and the local community
- develop built environment education support materials for teachers that demonstrate how built environment projects can be developed across scales
- foster peer learning, recognition and exchange around best practice built environment education
- create a directory of built environment practitioners who are available and committed to supporting built environment education
- provide professional learning opportunities for schools
- integrate students' perspectives of the built environment into proactive design improvements.

Key messages for educators

The project provides a snapshot to inform directions for curriculum development and support in the topic area of the built environment and will be of value to educators when developing resources and strategies for school students. The findings of this research project broadly contribute to an understanding of students' attitudes to the built environment and point to ways in which an early exposure to these ideas may, in fact, influence a broader appreciation and concern for the built environment.

Our research uncovered students' awareness of social and recreational environments. These are the places where they invest their social time (e.g. school, local shopping centres, parks). Although they are critical of these places, they do not have a strong sense of how to improve or change these areas. Students lacked a range of expressive capacities to describe what they see or experience. This suggests a strong need for more active enquiry oriented approaches to engage students with the built environment. Such approaches foster a connection and consideration of local surroundings.

Those teachers interviewed reflected on the challenges of teaching the design process in the context of the built environment. This in part related to the lack of syllabus support material across built environment disciplines. Everyday environments of their students were not generally being utilised as the focus for built environment enquiry and learning in schools. Students need to be engaged in actively exploring and experiencing the built environment. Boredom with the built environment comes not through the nature of the content itself, but the way in which it is delivered. In delivering design modules, teachers can incorporate a variety of tactile learning activities. In our research, we incorporated drawings and photographs as a medium for students to express their thoughts regarding their surrounding environs. Our resource audit provides a starting for exploring relevant learning materials.

Fostering reflection and evaluation of experiences in the built environment are key challenges for educators. These aspects of the design process are often overlooked or considered difficult as students and teachers traditionally associate design and technology with hands-on activity often situated in an industrial arts workshop setting. The context for learning about the built environment needs to be diverse and students should be encouraged to consider their everyday lives as sites for enquiry, reflection and appraisal. A challenge exists for educators to rethink how we document, reflect and appraise the outcomes of the design process and the mediums in which we do so.

Learning must be grounded in the concerns, needs and aspirations that each student has for their local built environment. The exploration of the built environment needs to be centred on a problem context that has been defined and constructed by the students, not by the teacher or educator. Accessible scales for project-based learning (e.g. a student's bedroom) are effective as they are tangible and relevant to the student. A tangible and accessible context fosters a greater capacity to engage in the problem solving process.

Educators should link learning in design and technology with concepts of active citizenship by linking with real world projects in their local area. Various sustainable schools initiatives (e.g. the FBE Sustainable Living Challenge, NSW Sustainable Schools Initiative and the Commonwealth Australian Sustainable Schools Initiative) provide existing frameworks to support this form of project-based learning. The challenges of sustainable development engaged by these programs provide a broad and significant context for active enquiry in the built environment that links concerns in student's local area with bigger picture issues and challenges. To counteract difficulties associated with engaging students in 'big picture complexity', students should be gradually exposed to challenges in design and the built environment gradually to progress through scale. An initial focus on objects or products can be evolved into enquiry into larger settings.

Key messages for professional associations

A gap exists between professional associations of built environment practitioners and learning in schools. Professional associations across all built environment disciplines have a strong catalytic role to play that can support learning. This role is varied and diverse, and perhaps only limited by the imagination of the organizations themselves. Key roles relate to supporting professional learning by teachers in each discipline, communicating current challenges facing the built environment, and recognising and celebrating the importance of student perspectives. Young people need to feel their 'voice' is valued and that they hold a valid perspective of the problems and issues in the built environment.

The relatively recent introduction of the built environment stream has created a demand for a range of syllabus support materials. These materials need to be developed with the involvement of teachers to ensure that they are relevant and adaptable to various classroom and school contexts. The rigid nature of many existing resource materials and kits developed by education professionals for teachers do not allow for a level of professional interpretation and adaptation (e.g. files that can not be edited, copied or used in part). The involvement of teachers in the development of support materials itself constitutes an effective form of continuing professional development. Linkages between professional bodies of teachers and built environment professionals can be strengthened to support this.

Professional associations and educators share a common challenge that stems from how students are engaged in the learning about the built environment. Both benefit from approaches to learning that excite and engage students in design and built environment concepts. For professional associations, this interest and excitement increases the awareness of the relevance of built environment disciplines as career pathways and also as future recipients of their outputs as built environment professionals. Developing an active and well-informed community around the current issues of the built environment is a key challenge that can be tackled initially through supporting effective learning in the middle school years.

Many teachers reflected on the challenge of keeping abreast of latest thinking and debates across the diversity of disciplines in the built environment. Specifically, teachers found it increasingly difficult to relate current thinking around sustainable development to learning in the classroom in a practical and easily accessible way. They were very conscious that students needed to be engaged in the opportunities presented by such a significant challenge for built environment professionals, yet found little support accessible to them. Professional associations should produce accessible and adaptable profiles of design and built environment challenges that clarify current research and debates within each profession to support active enquiry and reflection. These profiles should be drawn from local examples of current projects that demonstrate leading practice in design and the built environment.

Professional associations may consider how they can support and foster similar organizations for teachers interested in the built environment across all stages (K – 12). Currently there is no such reference point for teachers accessible to all school systems (e.g. public, independent and catholic). Such an association for built environment educators could coordinate support for innovative professional learning about the built environment and facilitate initiatives designed to link teachers with other built environment professionals through peer mentoring and school visits. The Built Environment Design Professionals Action Agenda may provide a suitable forum for progressing these issues.

Key messages for policy makers, governments and the development sector

This research suggests that an active learning approach to engaging young people in the built environment is crucial. Enabling students to explore their local area in a way that is meaningful to them and that encourages them to consider potential problems and issues that require change is a central aspect of this process, but one that many teachers find difficult. There exists an enormous potential to further support learning in and about the built environment. Approaches that simply focus on the classroom practice of teachers will not be effective; rather a whole of community approach is needed that resembles the kind of multidiscipline collaborations evident in private practice.

An impediment to quality learning about the built environment exists given the lack of connect to practice in private and public sectors. A reconceptualisation of the classroom is required that not only extends the context of learning beyond the four walls into the school itself, but also to acknowledge the role that policy makers, governments and the development sector can play as catalysts of innovative learning that is grounded in the real world.

Key roles are twofold: one of educational support and one of active idea integration. Similar to the professional associations' capacities to support discipline specific learning, the development sector's role can contribute as a supporter and enabler of this process. Currently, many private practice firms direct resources towards education and professional learning. This activity needs to be expanded and better coordinated to

be linked across scales and contexts to better foster peer learning opportunities for teachers. Private practice has the potential to inject a diverse range of resources into this process as a form of targeted corporate social responsibility that draws on and profiles their experience in built environment projects, locally and internationally.

Teachers reported a difficultly in accessing leading practice case studies in a usable format suitable for classroom adaptation. A significant potential exists for current projects to become focuses for classroom learning through real time profiles and information updates. Those projects that demonstrate leading practice in sustainability are particularly relevant given the holistic and multidisciplinary nature of sustainable development concepts.

This research highlighted that there is still some way to go before genuine involvement of young people in the built environment exists. This extends beyond the classroom and the need for young people to define their problems contexts and subsequent line of enquiry. It asserts the importance of engaging young people in the design and planning of places in the built environment that are representative and inclusive. This form of genuine involvement surpasses simplistic notions of community consultation and asks young people to actively create their preferred built environment and highlight those issues and challenges that are relevant and meaningful to them. To implement this approach would see young people acknowledged as equal stakeholders in the design and development process when creating local parks, shopping centres and other places expected to be used by them. It would also give rise to the creation of places that are solely designed for young people by young people.

Often at times, the only places "designed" for children and young people are educational facilities and recreational areas. In the snapshot taken in this research, students possessed a limited awareness of public open spaces as a designed environment for any activity other than sports. The findings of the drawing and photography activities demonstrate that students are social beings and seek places to 'hang out' with their peers. These perspectives can provide a valuable insight when designing localities for children and young people.

To ignore the voice of young people in the creation of the built environment risks ignorance in pretending to know what is meaningful and relevant to them. These concerns relate across all aspects of the development process from the function of particular places and their aesthetics to the nature and style of language used to communicate with young people. We must be conscious of involving and empowering young people in the creation of their world. While teachers and educators can play primary roles in establishing awareness of the built environment, those situated in policy, government, and development sectors can incorporate and reinforce young people's perspectives through neighbourhood design policy and practices. This requires great leadership to demonstrate leading policy and practice of the kind that is evident internationally (e.g. 'OASIS' in the United States, 'CLEAN' in India and 'CABE' in the UK). The genuine involvement of young people throughout the development process is considered leading practice internationally.

1.0 Our project

This research project, funded by the NSW Architects Registration Board, sought to explore understandings of the built environment in years 5 to 8, in NSW public schools. It was undertaken by FBE**Out**There!, a community engagement unit based in the Faculty of the Built Environment at the University of New South Wales.

The project gained insights into the *thinking and understanding of school students in the middle years of schooling about the built environment; and the extent to which an understanding about the design process influences their attitudes to the built environment*. It provides a snapshot to inform directions for curriculum development and support in the topic area of the built environment and will be of value to educators when developing resources and strategies for school students. The findings of this research project broadly contribute to an understanding of community attitudes to the built environment and point to ways in which an early exposure to these ideas may, in fact, influence a broader appreciation and concern for the built environment.

In liaison with the New South Wales Department of Education and Training (NSW DET), the project utilised a qualitative methodology in which we conducted activity-based, facilitated discussions with primary and secondary students and semi-structured interviews with their teachers. Furthermore, survey questions were distributed to teachers state-wide and a resource audit related to built environment education was undertaken. The NSW DET Ethics Secretariat and the UNSW Research Office provided liaison and support to enforce protocols surrounding research in schools. This research received ethics approval from both the NSW DET and UNSW Ethics Secretariats.

1.1 Context for the research

The built environment component of the NSW Design and Technology syllabus addresses the space, place and use of human-made surroundings. According to the NSW Board of Studies (2003), this area of the syllabus considers the "functional, physical and material properties, aesthetic, ethical, environmental, socio-cultural, human form and scale and safety aspects of the development" (p. 15). It is considered by teachers to be the least well understood, and hence, least taught aspect of the syllabus. Teachers have also provided feedback to DET that they find aspects of the syllabus difficult to engage and there is little consideration to date of the cross over between primary and secondary school years. The NSW DET consider there is strong potential for the built environment to engage young people in rich learning experiences as it encourages enquiry and consideration of their day-to-day lives within a context that is familiar, meaningful, and relevant. Therefore the research project outcomes seek to support the aims of NSW Quality Teaching Project.

1.2 Background

The design process could be considered central to the curricula of Science and Technology (Yrs. K-6), Technology (Yrs.7-8), and Design and Technology (Yrs 7-10). Using the design process can provide solid teaching and learning foundations for the built environment component. However, general understanding of the design process continues to evolve as there have been numerous attempts to describe the design process. As an educational skill, the design process has been portrayed as the "fulfilment of need" (Johnsey, 1995) "problem- solving activity" (Rogers, 1998), and "developing solutions that meet authentic needs and opportunities" (NSW Department of Education and Training, 2007). Hill & Anning (2001) conducted a study to gauge the design process among students aged four to nine years of age. Their study further clarified the design process from the perspectives of design professionals. Recurring characteristics of a student who engages with the design process include:

- good observation skills of their surroundings
- capacity for idea generation and effective communication
- demonstration of curiosity and the ability to ask questions,
- engagement with the iterative process of design (Hill & Anning, 2001).

In New South Wales, students are exposed to a design process involving investigation, design, creation, and technological skills. Investigation encourages students to stimulate and nurture their inquisitiveness while incorporating a process of scientific discovery. "Design involves analysing needs, exploring and generating ideas, evaluating alternatives and managing ideas to a workable solution" (NSW DET, 2007). Through investigation, students seek problems to solve or questions to answer. Upon discovery of a "problem" or "question", students are generally instructed to generate and implement a resolution through the production and utilisation of mental images. Thus begins the dual activity of designing and creating. The act of design and creation may be implemented through the aid of technology.

Embedded in the design and making process is the ability for students to reflect and evaluate the entire process. Such reflections incorporate a circular or iterative process whereby students begin to imagine their human-made surroundings, interrogate them, make decisions regarding unanswered questions, and generate activities grounded upon these decisions. Reflection and evaluation become integral components as they link defined problems with solutions sought (Benenson, 2001). Appraisal and reflection by the student in consultation with the teacher at each step brings continuity to the project.

This brief literature review seeks to uncover the challenges embedded in teaching the design process. Impediments to the seamless teaching of Design and Technology appear to include a limited personal understanding of the design process, context specificity, disconnection between design sequences, and exclusion of evaluation. While this review is not meant to critique the current teaching of Technology in New South Wales, it does highlight emerging opportunities to alleviate these challenges through understanding students' ways of learning, introducing problem finding/posing,

and using the built environment as a platform for designing learning and teaching opportunities.

1.2.1 Challenges to teaching the design process

Personal understanding of the design process

Personal understandings of design and technology education remain underdeveloped (Mawson, 2003). Teachers place different emphasis on the design process based upon their individual understandings and knowledge base. Ultimately, how the process is explained by teachers is how students begin to undertake the process (McCormick *et al*., 1994).

For example, in New South Wales, there is a perceived complexity about teaching and incorporating the "Built Environment" into Technology classes. There is no hierarchy between the three content strands of the Science and Technology syllabus. In addition to "Built Environments", teachers must base design projects on "Products" and "Information and Communication". As such, teachers may differ in the extent to which these strands are taught. In Stage 3, for example, the specific strand of "Built Environment" may not be easily incorporated into classroom activities when compared to the more tangible aspects of "Living Things" or "Products and Services". Students may then miss out on the opportunity to learn about the "Built Environment".

Context-specificity

When viewed as "problem solving", the design process "requires expertise in the context of its application" (McCormick *et al*., 1994, p.146). Teaching general problem-solving skills ignores the procedural and conceptual understanding of the design process. Each design problem requires specific knowledge. Students engaged in design need to understand both the "hows" (procedural) and the "whys" (conceptual) of the design issue at hand (Lewis *et al*., 1997). Procedural knowledge is dependent upon conceptual knowledge. The design of the product (i.e. materials and structure) is determined by the student's understanding of the proposed function of the product (McCormick *et al*., 1994). Contingent upon the design problem at hand, the knowledge demands between each design problem differs. When there is an imbalance of understanding between procedural and conceptual concepts, students stray from the holistic aspects of designing.

Disconnection between design sequences

Teaching design and technology emphasizes the teaching of processes (McCormick *et al*., 1994). Technology is an integrated activity yet the design process is often separated into isolated stages. Williams (2000) contends, as it is taught, that activities are not an end in of themselves but rather provide a basis upon which students build creativity, reflexivity, and critical discernments. He urges that components of the technological process be viewed as "aspects rather than stages" (Williams 2000, p. 52) as stages have a sequential connotation. A sequential or linear connotation may have the effect of representing the design process as a series of end products (Chidgey, 1994; Johnsey, 1997; Mawson, 2003). If students are disconnected from the iterative process of design,

they become focused on design as a product and not design as a process (Jones, 1997; Hill, 1998; Stein *et al*., 2000).

In their seminal study, McCormick *et al*. (1994) investigated how students perceived and used the design process. Their study highlighted a student's inability to comprehend the complete design process of making a kite. For one student, problems of deciding which material to use, fixing the joints in the frame, and keeping the shape stable became isolated problems as the student did not relate the conceptual understanding of kite components to the process of design. The student focused on the problems that had emerged as opposed to questioning how it all related to the whole of the design problem. The lack of explicit treatment of each aspect of the design process leaves students with isolated tasks and the subsequent inability to distinguish the relationship between the components of the design process or problems of the task. Solutions that result from a disconnection of the design sequences result in what Lave (1988) refers to as "a veneer of accomplishment". It is imperative for teachers to reference linkages between aspects of the overall design process and view the process as a range of techniques, demonstrated and applied.

Exclusion of evaluation

The design process is rarely a direct progression from problem to solution. "Design is a nonlinear messy affair that generally involves considerable backtracking and revision of the original specifications" (Benenson 2001, p. 738). It is important that students understand the iterative process of design. The difficulty in teaching this iterative process is that it "runs counter to the prevailing paradigm in education that holds that an answer is either right or wrong, leaving little or no room for students to work their own way toward better solutions" (Benenson 2001, p.9). In other aspects of their learning, students are often encouraged to think in absolute terms of "right and wrong". In the design process, however, there are many right answers; some more "right" than others depending on what one is trying to achieve.

Therefore, this capacity for judgement and valuation is an integral component for students to learn and practice as it reinforces the link between problems and solutions (McCormick, 2004). Instead of student appraisal at the end of the project, evaluation is valuable throughout all aspects of the project. Evaluation prompts continual reflection, testing, modification, retesting, re-evaluating as the student progresses through the design cycle of their selected design problem (Neumann, 2003). Often, however, students focus on producing a product, and "rarely stop to analyse the advantages and shortcomings of their own creation" (Benenson 2001, p. 731).

There is a weak link between the "draw-and-make" processes, when students are working through to a solution. Case studies have demonstrated that after making a concept drawing, students rarely refer back to this initial representation of their idea during the "making" process (Rogers, 1998; Welch *et al*., 2000). Students cannot develop full comprehension of the design process by merely doing. There needs to be embedded an awareness and understanding of the connection between the design problem and solution. Hill and Anning (2001) conducted a study to gauge the design process among students aged four to nine. Grouping 8-9 year olds, their study found

that this group used the drawing process to highlight the aesthetics of the project as opposed to delineating the strengths or weaknesses of its functional qualities. Students generally needed "initial verbal interaction" to sort through their design ideas. Verbal interaction stemming from teacher and/or peer interaction could assist with the facilitation of a student's idea.

1.2.2 Incorporating students' perspectives of the built environment

The dynamic aims of technology and design education involve connecting students' class work to real world experience. Insight into students' built environment perceptions provides the foundation to identify problems in the neighbouring area. If this is the case, what do children and young people view currently in the surrounding built environs?

Previous interdisciplinary research regarding the built environment has often explored user perceptions. Perspectives provide the framework for understanding new concepts, identifying current issues, and formulating initial solutions (Matthews, 1992; Woolley, 1999). Children's and young adults' perceptions have particularly informed built environment discussions. Seminal works regarding children's and young adults' perspectives of their local human-made surroundings include:

- Florence Ladd (1970) conducted one of the first exercises working with children in the United States. She sought to understand the definition of neighbourhood from the perspective of black adolescent youths. Through mapping activities and interviews, the youths were able to reflect and make sense of coherency and complexity within their neighbourhoods.

- Kevin Lynch (1977) and his team of researchers observed how children living in Argentina, Australia, Mexico, and Poland moved through and adapted to their built environments. Lynch's work helped to conceptualize component parts of young people's spatial knowledge. The research was innovative in its situated and youth-centred activities and the range of communities selected across four continents.

- Roger Hart (1979), over a period of two years, observed children in a small New England town in the United States. He studied children's spatial activity, place knowledge, place values, and place use. Hart's research constructed a comprehensive account of children's engagement with their local surroundings focusing on their spatial behaviour and land use.

- Chawla and Malone (2002) revisited Lynch's work with youth conducted in four countries. Through an edited collection of research, they provided contemporary accounts of the activities of children and young adults in the four countries in addition to four additional countries. The findings were consistent with Lynch and depicted children and young people's attraction to and disinterest in the built environment.

These works indicate that children create and maintain an active relationship with their surroundings. Children contribute to, create, and direct their own lives and environment (Christensen & O'Brien, 2004). An investigation into these seminal works regarding children's perspectives of the built environment elucidates recurring themes as outlined in Table 1. Although the term "built environment" was not used in any of the researchers' descriptions of the projects or in children's detailed experiences of the neighbourhood, an extensive knowledge of buildings, areas and infrastructure was specified collectively by the children. Aspects of the built environment are perceived and acted upon daily by children. Objects and areas of the built environment were depicted by children to possess dichotomies of activity/ boredom, safety/danger, and incorporation/exclusion. Often, these dichotomies acted as a springboard into discussions regarding the problems and subsequent changes they would like to see occur in their local environs. Children possess preferences about where they do and do not like to explore, inhabit, and frequent.

Table 1 Selection of Children's Views of the Built Environment

Categories	Objects	Perceptions
Retail areas	Corner shops Building sites Petrol station	Accessible Derelict Exploratory
Residential areas	House Patio Rear yard Big backyards	Relaxation Socialisation Boredom Discovery
Recreational areas	Beach Playing fields Parks	Lack of Access Fun Socialisation
Roads and Transport	Footpaths Streets Zebra crossings Buses	Accessibility Traffic Safety Fast drivers Crowded

Taking these preferences into account can inform learning processes within the built environment content stream of Technology Education. As such, "Understanding the Built Environment" research project endeavours to gauge the current thinking and understanding of school students in the middle years of schooling (years 5 – 8) about the built environment by querying their awareness of preferences for their human-made surroundings.

Inspired by the aforementioned studies, this research applied standard qualitative research techniques to explore 'attitude, perceptions, understanding and experience' of a diverse yet small sample of students and teachers. Qualitative, thematic analysis of interviews, drawings and photography were also undertaken. This research provides a snapshot that will contribute to an increased understanding of the built environment with view to informing enhancing syllabus support for the teaching of the built environment in middle school years.

2.0 Our approach

A variety of qualitative techniques was used to capture an understanding of children's experiences and thinking about the built environment. This section will discuss the nature of the participants recruited and the research activities conducted.

2.1 Participants

Participants included students from nine schools around NSW as listed in Table 2. In selecting the schools, we sought geographic representation from a range of locations, covering urban, suburban, and regional contexts. We also sought to ensure socio-economic and cultural diversity, and to identify areas where there was both a primary and secondary school within the study sample.

A total of 155 participants contributed to our research; 78 secondary school students and 77 primary school students. The students were in Grades 5 to 8, with an approximate age range of 8 to 12 years, although age was not a criteria for selection.

Table 2 Summary of School Participants

REGION	Location	Number of Participants
Sydney	*Urban*	
Randwick Boys High School	Urban	17
Randwick Girls High School	Urban	15
Randwick Public School	Urban	16
Sydney Technical High School	Urban	16
Bexley Public School	Urban	22
South Western Sydney	*Suburban*	
Bossley Park High School	Suburban	17
Prairievale Public School	Suburban	11
Western NSW	*Regional*	
Kelso High School	Regional	13
Kelso Public School	Regional	28

2.2 Activities

A variety of quantitative and qualitative methods were used to gauge students' understandings of the built environment. To illustrate these understandings, perspectives from both teachers and students were gathered. To grasp the nature of built environment education from teachers' points of views, surveys and interviews were conducted. An email questionnaire was distributed to all primary and secondary schools. The survey was designed to gauge the extent and nature of engagement with the built environment concepts and to generally identify how and if D&T teachers were using the local surroundings in their teaching. It was in no way meant to evaluate the state or quality of teaching in Design and Technology (See Appendix B).

Teachers of the participating classes were interviewed to provide their thoughts and experiences of teachings about the built environment (See Appendix C). An audit of selected resources for teaching and learning in the built environment was also undertaken to identify key learning strategies that explored the design process, interpreted the built environment, and incorporated sustainability concepts. Potentially, these are the sorts of resources that could be beneficial to Design and Technology teachers interested in engaging with the Built Environment strand of the syllabus (See Appendix F.)

Students were directly queried about their attitudes and perspectives through drawing and photo activities. These activities were intended to provide a visual and hands-on approach to define the constructed elements of their neighbourhoods that they liked, disliked, and wanted to change. An overview of the research activities used is depicted in Table 3.

The sequence of research activities involved:

1. Send out questionnaire to all technology teachers and networks
2. Send out project background, permissions and activity kits to teachers from sample schools
3. First visit to sample school (project introduction, relationship building, collect drawings, present photo activity, and conduct teacher interview)
4. Posting of cameras to film developer by teachers from sample schools
5. Processed film sent from developer back to respective schools for teachers to conduct photo activity; and,
6. Second visit to sample school to discuss photo collage with the students, and debrief project.

Table 3 Summary of Research Activities Undertaken

Target	Method	Process	Outcome
Technology teachers (NSW)	Questionnaire (Electronic) (See Appendix B)	Email and fax distribution, through technology teacher associations, schools & networks.	Nature and extent to which teachers engage built environment issues.
Sample teachers	Semi structured in-depth interview (See Appendix C)	Conducted at school, on the second visit. The audio will be recorded and coded.	Insights into experiences in teaching the built environment to provide an understanding of barriers and suggestions for resource support.
Sample students	'Our space' drawing activity in the school and surrounding area (See Appendix D)	Students will create an illustrated map of the school grounds and environs, highlighting those features considered noteworthy or outstanding.	Demonstrate a level of geospatial capability and capacity to describe landmarks in the school grounds and broader community.
Sample students	'My place' photo activity in your neighbourhood (See Appendix E)	Students will be asked to take photographs of their own home/neighbourhood environment with the intention of highlighting particular features in a collage with an accompanying description of the environment(s) depicted.	Understanding, perceptions, attitudes and appreciation of their everyday built environments.
Built environment educational resources	Resource Audit (See Appendix F)	Canvassing key stakeholders in technology education and conducting review of existing resources.	Provision of leading educational strategies incorporating the built environment, design process, and concepts of sustainability.

3.0 What we gathered

Using a variety of methods across a spectrum of participants resulted in a rich insight into the built environment.

3.1 From Design and Technology teachers

A survey was conducted across the entire NSW community of Design and Technology teachers. A combination of nine open- and closed-answer questions was delivered via online survey software. A total of 162 responses was received from teachers across stages 3, 4 and 5. Twenty- seven per cent of all respondents were teaching stage 3. The survey provides greater insight into the context of teaching the built environment and the nature of the issues that have emerged through the research. Given the extent of the sample, the survey provides further snapshot data that provides capacity for triangulation and assists to inform some of the emergent recommendations.

The survey highlighted a number of key points:

- **the diversity of issues that are explored under the banner of the 'built environment'**, ranging from: tools, appliances and storage systems to water reuse and recycling, garden and interior design, agriculture, shelter and transport systems, architectural design, sustainability, energy efficiency, infrastructure change, to environmental management, overpopulation and social exclusion;
- **the challenges associated with teaching the built environment** include: a lack of personal experience with the concepts and issues, a lack of technical skills and resources, the social and cultural aspects of design, difficulty of teaching creativity, building an understanding of scale and the 'big picture' nature of enquiry in the built environment;
- **the needs and opportunities that exist to further support the engagement of students in exploring the built environment**. Opportunities exist: to support professional learning in discrete content areas and emerging teaching and learning processes, for greater networking and exchange, and to build linkages to activity associated with the NSW Sustainable Schools Network and Quality Teaching frameworks.

3.2 From teachers from our sample schools

Semi-structured interviews were conducted with at least 1 teacher from each participating school, 11 teachers in total. The interviews provide greater insight into some of the issues that surround Design and Technology education, and specifically in teaching the built environment, highlighted by survey respondents. The interviews are vital to understanding the nature of enquiry required to engage young people in the built environment. The key themes that emerged from the interviews are: the role and nature of the problem context, the process of exploring the built environment, enquiry that fosters significance and opportunities for innovation in teaching the built environment.

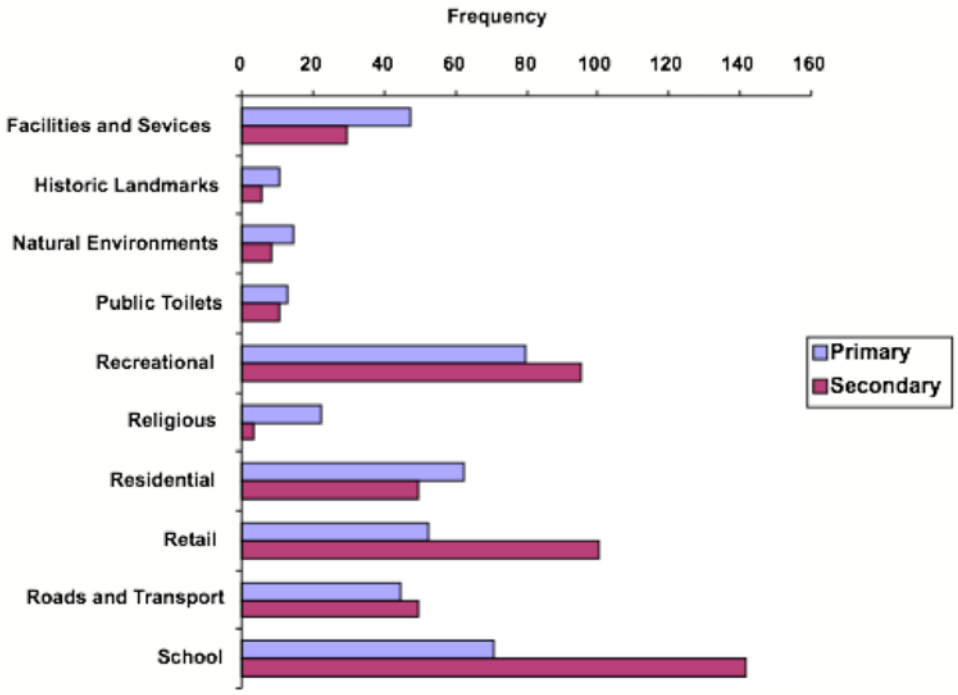
The interviews highlighted:

- the importance of the students' perception of the relevance of an issue or context that is being explored
- the challenges associated with engaging early stages in larger scale considerations of the 'big picture'
- the differences between active and passive enquiry and its relevance to sustaining interest in the built environment
- the challenges of empowering young people with a sense of agency and a capacity to create change as a staring point to generate innovation in the design process
- the role that sustainability can play in providing a holistic framework for enquiry into issues of the built environment,
- the primary challenge and thus opportunity for engaging young people in the built environment is linked to *delivery* and not the *nature* of the content itself.

3.3 From the students

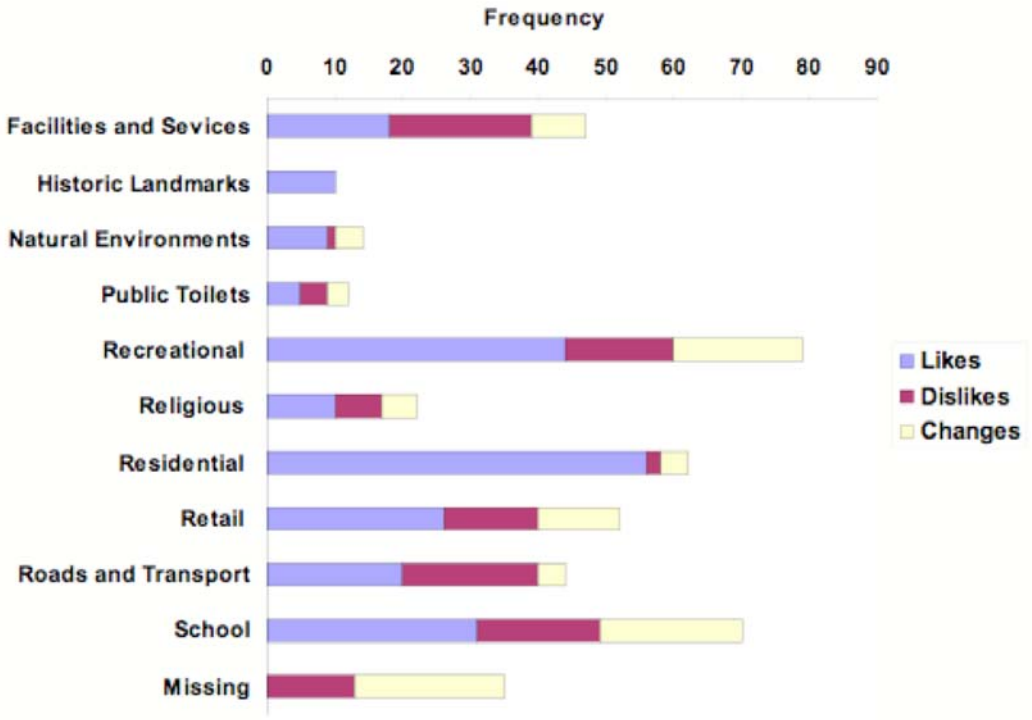
The drawing and photo activities identified prominent features within the built environment that are of interest and concern to young people. All of the features were counted and assembled into ten distinct categories. Figure 1 highlights the built environment elements mentioned by both primary and secondary students in the drawing and photo activities. Elements related to recreational areas were most

Figure 1. Frequencies of Built Environment from Primary and Secondary Schools



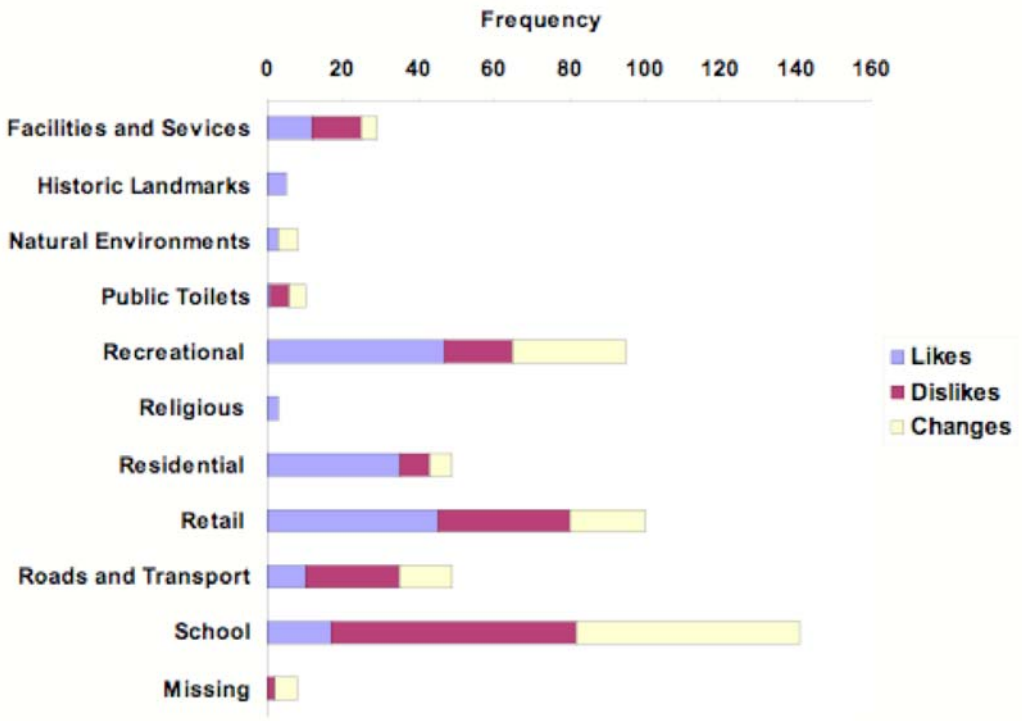
mentioned by primary school students while school-related areas were most mentioned by secondary school students. The following figures further separate these ten categories into three classifications. These classifications include: "I Like," "I Dislike," and "I would like to change." Figure 2 reflects the outcome from primary school students while Figure 3 features the insights from secondary school students. Figures 2 and Figures 3 include an additional category entitled "Missing". This category indicates that a student refrained from including an element of dislike or did not nominate an element to change as requested during the drawing activity.

Figure 2. Elementary School Frequencies of Built Environment Elements



For primary school students, elements related to residential areas were depicted as "most liked". Facilities and services were chosen by the students as parts of the built environment most disliked. Primary school students divided their thoughts regarding things to change. The highest frequency in this category related to either not nominating areas to change or wanting to change areas related to the school.

Figure 3. Secondary School Frequencies of Built Environment Elements



For secondary school students, elements related to recreational areas, closely followed by retail areas were depicted as "most liked". Areas related to the school were chosen by the students as parts of the built environment most disliked. Incidentally, students then made the most suggestions to change these school-related areas.

This section describes the specific elements related to the built environment categories.

School related areas

The school was the most frequently mentioned element by secondary school students. It was the second most mentioned element by primary school students. The school was often targeted as an element of dislike with personal reasons ranging from "too much work" (Kelso PS student) to "it's too long and boring" (Bossley Park HS). Many suggestions were offered by secondary school students to knock down school areas simply because they did not like the subject associated with the building. Nevertheless, many other students took pictures of their schools noting how much they liked learning and being with their friends. The social function of the school was strongly highlighted from Bexley and Kelso Public Schools and Bossley Park HS. As a student from Bossley Park HS wrote: "Schools can be a great place but sometimes it can be a tough place with many disappointments and break

up with friends." To increase social opportunities, students from Sydney Technical HS stated that they would like to make their school co-ed. Likewise, a Randwick Boys HS stated to "combine both Randwick Boys High School and Randwick Girls High School. I would get signatures or send messages to Board of Education."

Besides the general nature of the school, specific areas and rooms were nominated as areas of dislike and areas they would like to change.

- **Carpark.** Public students noted the danger present at their respective school's carpark and wanted it to change because: "it is hazardous and children can get run over (Bexley PS student) and "it has too many cars and it is not safe" (Randwick PS student). High school students shared: "I don't like the look of it" (Bossley HS student).
- **Toilets and change rooms.** A Randwick Boy HS student shared his dislike for the toilets because: " it's all dirty and smelly and has no toilet." Many of his peers concurred. A student from Randwick PS similarly wanted to "change the toilets to make them less smelly and clean." Changing the ventilation was a solution rendered for the stuffy conditions of the change rooms by students from Sydney Technical HS.
- **Sport facilities.** In general, Randwick Boys HS students desired to make their gym bigger. A specific requests for a swimming pool was submitted by a student from Prairievale PS. Sydney Technical HS currently possesses a pool yet its students stated that it is a "neglected feature that takes up space & remains unused and abandoned" and that it has "lost its glory. Murky waters is the worst part of the pool."
- **Grass**. A Prairievale PS student disliked the school "because there is to much concrete and not much grass" (Prairievale PS). A Randwick PS student concurred.
- **Levels of comfort**. There were several suggestions made by students to make the school better for them. This included requests for "air condition all rooms," "move school closer to home or fix bus time table to make it easier to get home" (Sydney Technical HS), and "change the hallways and make them bigger" (Bossley Park HS).

Recreational areas

Areas for recreation were the most cited elements by public school students and third most cited element by secondary school students. A variety of sport and play areas were recognised as areas of pleasure as well as areas in need of improvement.

- **Park.** Many students described the pleasure the local park provides. It is a place to be social (Sydney Technical HS), to quietly reflect (Randwick Girls HS), to have birthday parties (Randwick Boys HS), and more generally a place to play. Students were critical of the lack of amenities in their local parks (Prairievale PS and Randwick Girls HS) and the presence of rubbish and older teenagers (Bossley Park HS). A student from Kelso PS specified a dislike for the park "because the grass is really long and itchy." Changes for the park

included " toilets, shade, and the bridge so its a better sportsground" (Kelso HS).

- **Playground.** Students singled out the playground as a favourite place because of its proximity (Bexley PS). More students, however, wanted to change the playground equipment to fit their needs (Bossley Park HS). A Randwick PS student wrote "it's too small and the equipment is too small for year 4, 5, and 6s."
- **Soccer fields.** Students appreciated the opportunity to play at their local soccer fields (Randwick Boys HS, Kelso PS, and Bexley PS). They were quick to suggest improvements such as more lights (Bossley Park HS). Specific changes included "I would like to change the trees because it gets in the way of our soccer game" (Bexley PS) and the "dirt because it herts you legs when you slide tackle" (Kelso PS).
- **Basketball courts.** Courts were mainly mentioned in a favourable light. Public school students like to play basketball (Bexley PS, Kelso PS, and Prairievale PS). A suggestion from Randwick Boys HS included: "Make it bigger and add more basketball hoops and more nets."
- **Swimming pool.** Personal home pools were noted for their proximity (Prairievale PS and Randwick PS) and public pools were noted for their social opportunities (Sydney Technical HS). Students cared about the cleanliness of the pool. "I'd like it to be cleaner…It's really disgusting when you're swimming to see band aids & people spitting into the water" (Bossley Park HS) Furthermore, a Prairievale PS student wanted people to "stop the spitting in the pool." Students desired to change current pool conditions to contain more elements of entertainment such as waterslides (Randwick Girls HS) so "it would be more like a water park" (Randwick Boys HS).
- **Skate parks.** In areas which lacked skate parks, there were requests for their provision (Sydney Technical HS). Accessing skate parks in the area, Kelso students sought improvement "We need a bigger skate park and more 1/2 pipes and drop in pits," (high school) and "more ramps put more in" (public school).
- **Bike tracks.** In Kelso, many students reported the fun associated with the bike tracks. A few commented on the state of the tracks, " I don't like the dents on the road and track."
- **Beach.** Students noted the affordance provided at the beach to swim, surf, and socialise (Bexley PS, Randwick Boys HS, and Randwick Girls HS). A few were concerned about their safety and advocated change: "More safety," (Bossley Park HS) and "Too many blue bottles" (Randwick Girls HS). Many students of Kelso High School wanted to "Move Bathurst to the beach."

Retail areas

Areas related to retail were the second and fourth most cited elements by high school and public school, respectively. Retail areas included those areas where food, clothing, and entertainment could be purchased.

- **Food shops.** Students observed the benefits of having a local food shop (Bexley PS and Bossley Park HS). A student from Bexley PS requested for the local bead shop to be changed because "No-one likes going in and it's useless. Maybe a food shop will be better." More students were aware of the adverse health effects of fast food offered by some of the fast food chains. "McDonalds makes you fat, too oily" (Prairievale PS). A Kelso HS student offered that McDonalds should be changed into a fun park. Red Rooster and Kentucky Fried Chicken outlets were also targeted as disliked areas because of the "yucky" (Kelso PS) and "fatty" (Randwick Girls HS) food. Finally, a Randwick Girls HS remarked, "I would like to change the takeaway shops because people eat them and there is a few people who have past away from being obeiss [*sic*]."
- **Pubs and bottle shops.** Students identified that areas which sold alcoholic beverages were highly disliked. "The pub has too many fights. They should destroy it!" (Kelso HS). To change this, a Randwick Girl HS student suggested, "I'd put a small playground where the pub is." In addition to pubs, bottle shops irked many students. "I don't like liquor land because anyone will be drunk and hurt children or injure and crash into people" (Prairievale PS). A student from Randwick Girls HS goes on to explain: "The bottle shop is a potentially dangerous place. At least a few people get drunk there and disturb us by starting fights and loud screams. I would impose stricter security and probably try to stop sales of liquor after 9pm, probably like a curfew. As well as restrict sales of too much liquor to one person.
- **Shopping centres.** High school students predominantly mentioned shopping centres and corner shops in their drawings and photo montages. Students enjoyed shopping at the corner shops (Sydney Technical HS) and at the shopping centres (Bossley Park HS and Prairievale PS). A few noted the deficiency of clothes shops and lack of variety (Bossley Park HS). Solutions were easily proposed to "Expand the shops so the new ones can fit" (Bossley Park HS) or to "Make it bigger" (Kelso HS).
- **Entertainment areas.** A variety of areas which offered students amusement were highlighted as desirable areas. Students from Bossley Park HS and Randwick Girls HS enjoyed the social opportunities offered by their local cinemas. Likewise, the local RSLs offered a social and athletic venue for students (Bossley Park HS and Sydney Technical HS). The local offering of the Mount Panorama race track delighted both Kelso primary and secondary students. A Bexley PS student disclosed the entertainment value of the athletic stadium. Conversely, a Bossley Park HS student wanted to change the local stadium because "It's too loud at night when games are on." In light of changes, students elected to alter their existing entertainment venues. A Prairievale student requested that the ten pin bowling be changed because "It's too small." To a Randwick PS student, the local Fox Studios needed to be changed "so it's as fun as Disneyland." Lastly, a Randwick Boys HS student wanted to change the video store to be bigger and better.

Residential Areas

Personal homes and neighbouring houses were the third most elected element by public school students and fourth most elected by high school students.

- **Homes.** Many students appreciated the shelter and comfort their own houses provided. They drew as well as photographed their homes. Some highlighted specific places of their houses like the backyard (Randwick Girls HS), the front yard (Randwick PS, Bexley PS), garden (Kelso PS), or their room (Sydney Technical HS). A few students emphasised a particular dislike for their home. "I don't like my backyard because there is a lot of trees, spiders, and other bugs and there is nothing to do" (Randwick Girls HS). A Bossley Park HS student stressed: "I want to live in a more peaceful and calming area. The place I live now is in the main road where buses and cars makes noises every night. Sleeping at night is hard. Sometimes I feel scared when home alone." Being alone was empathised by a Kelso PS student "I don't like my house because I get lonely." The need for friends in proximity was also shared by other students. "I would change these houses to my friend's houses so all of my friends can live in the same street as me."
- **Neighbouring houses.** Some students elected to share their sentiments about the neighbourhood. Most students vocalised their discontentment with the neighbouring houses. Two mentioned their dislike for the "architecture of it: it looks ugly" (Randwick PS) and "It's too small" (Bexley PS). A few pointed out the noise levels stemming from the houses (Randwick Girls HS).

Facilities and Services

Facilities and services include buildings that provide medical, educational, protection, and postal services.

- **Medical services.** Hospitals were depicted as areas of great fear and dislike. "I dislike the hospital because the needles and other yucky things" (Kelso PS). A Prairievale PS student reasoned, "Why would you wanna get hurt?" Orthodontic offices were singled out as areas that needed change. "Ouch, change to fun" (Randwick Girls HS). Nevertheless, hospitals were recognised as areas for restoration (Prairievale HS) and healing in a historic building (Sydney Technical HS).
- **Library.** Libraries were recounted favourably for its educational opportunities (Bossley Park HS, Randwick Boys HS, Kelso HS, Sydney Technical HS). A Prairievale PS student shared a dislike for the quiet atmosphere of the library.
- **Museum.** Museums were illustrated as areas of boredom (Randwick Girls HS). Subsequently, improvements were sought to "Change the boring information. Make to place more fun." A Kelso PS student enjoyed the local museum for the history it contained.
- **Protection services.** Police stations were represented positively as they ensured the community's safety (Bexley PS and Prairievale PS). The fire station was cited to be too noisy by a Randwick Girls HS student.
- **Post office.** A Kelso PS student shared the affinity felt as a personal artwork was displayed in the post.

Roads and Transport

The conditions of the road and the impending traffic were recognised by the students. Furthermore, students elected transport options to alleviate their levels of comfort.

- **Traffic.** Students appreciated the mechanisms used to increase their pedestrian safety. Pedestrian crossings (Bexley PS, Kelso PS) and speed limit signs (Prairievale PS) were depicted as favourable road elements. However, many students represent the roads as areas of danger. "I don't like streets because I might get bumped by a car" (Randwick PS). A Sydney Technical HS student disliked the congestion, noise, heat, and exhaust occurring on the roads. Bossley Park HS and Randwick Girls HS students shared stories of animals involved in road accidents. Recommendations to make the road more safe include pedestrian crossings (Kelso PS) and synchronising the traffic lights with the pedestrian signals because the "traffic lights take too long to change" (Bossley Park HS).
- **Transport.** Students liked the ability to get from one place to another on buses and trains. However, students urged for improvements to the transport system. A Bexley PS student shared, "I don't like the sign that says no bikes and skateboards because you cannot ride bikes and skateboards on the path." Students wanted the ability to be mobile. Buses were the target of enhancements as "Buses are always late and waste our time. They are also overcrowded" (Sydney Technical HS). A Kelso Public student concurred that "I have to wait for buses. I wish it would change." A Sydney Technical student also remarked how the train station is "extremely dirty, smelly, and is crowded with people."

Natural Environment

Students mentioned aspects of the natural environment that they took pleasure in as well as aspects that needed improvement.

- **Trees.** Trees were noted for their play benefits (Kelso PS) and their aesthetic beauty (Bexley PS). On the other hand, trees were disliked because they "make a mess" (Bexley PS) and trees take up space which could otherwise be used for open play space "I want to change this into a park" (Bexley PS).
- **Water.** Water features were noticed for their aesthetic comforts (Kelso PS and Sydney Technical HS).
- **Pollution.** Students highlighted the rubbish existing within natural areas. Students wanted to change the canal by having "more tadpoles and frogs in there. Clean it up! Because it is too dirty and there are old and dirty things in it" (Bossley Park HS). Likewise, students from Sydney Technical HS urged a cleanup in the forest to "remove rubbish dumped in that area."

Religious Areas

Through their drawings and collages, students depicted a variety of religious areas. The majority of students elected to share their partialness to churches, temples, and mosques for the personal time, education, and social opportunities each place

offered. Randwick Public School students, however, noted their dislike for the local cemetery because "it is not placed in a peaceful and calm place where the dead people can rest."

Historical Landmarks

Historical places featured in a few of the students' works. All students noted their fondness for these areas. Iconic bridges were recognised by Bexley PS, Bossley Park HS, and Kelso HS). ANZAC memorials were distinguished by Kelso PS and Sydney Tech HS students. Other historical areas were enjoyed for their aesthetics and proximity (Bexley PS) and for the music that takes place on the grounds (Kelso PS).

Public Toilets

Public toilets were singled out by many students as a major area for improvement. All mentioned the pungent smells of the toilets. Others mentioned the existence of "too many drunk people" (Kelso PS) and graffiti and vandalism (Sydney Technical HS). Randwick Boys and Girls HS both suggested that the toilets get cleaners and have them monitored.

4.0 What we learned

4.1 Students' viewpoints of the built environment

Children's and young people's experiences and subsequent perspectives of their neighbourhoods provide the foundation for discussing the relationship of technology and the world they inhabit. The students provided rich imagery of their local surroundings. Common among the primary and secondary schools, images relating to residential, retail, recreational, and academic areas demonstrated the relevancy of these areas in their lives. Local areas can be used as initial discussion points in regards to the design process.

Students shared their views about specific elements in which they liked and disliked. Primary school students showed a like for items occurring within their local sphere of home, recreation, and school. Secondary school students focused their appreciation for elements regarding recreation, retail, and residential. Given these areas of interest, students' perceptions can be directed towards initiating potential design improvements. Asking students what they would like to change about their surroundings fosters the design process. Table 4 provides a selection of students' views and suggested design changes.

Table 4 Selection of Students' Views of the Built Environment

Categories	Objects	Perceptions	Potential Design Improvements
Retail areas	Corner shops KFC Cinemas	More clothing shops Greasy food Can meet with friends	Corner shop redesign Healthier food Comfortable areas
Residential areas	Neighbourhood Backyard Front yard House	Noisy Boring Full of nature Where I live	Noise filters Play equipment Endemic species Room redesign
Recreational areas	Pool Soccer field Beach	Needs to be cleaner Muddy Too sunny	Cleaning contraptions Soccer field covers Shade enclosures
Roads and Transport	Kerb Streets Street lights Buses	Good for skating Cars drive too fast Not enough cross Too long of a wait	Skate park design Speed monitoring Pedestrian comfort Synchronised schedule

Younger students demonstrated a pronounced difficulty in identifying areas which needed to be improved or changed. Twenty one per cent of the primary school student participants refrained from sharing suggestions for improvement to the built

environment when compared to four percent of secondary school students. Primary school students could not conceptualise ideas on ways in which changes could be made to improve aspects of their local areas. Perhaps, primary school students are at the initial stages of identifying what it is they appreciate as well as what they find objectionable in their local surroundings. There also may be a lack of understanding about how changes take place i.e. the nature and role of design.

Nevertheless, all the shared student views are consistent with recent research conducted in Melbourne coordinated by the Growing Up in Cities (GUIC) project. Malone and Hasluck (2002) compared young people's perceptions (aged 10 -15 years) of their Braybrook neighbourhood in Melbourne, Australia at two different periods in time. Using data conducted in 1972 from Lynch and Downton's original project, they sought to replicate the study to compare the change in neighbourhood environs and children's perceptions of the neighbourhood in 1997. Through investigating children's perspectives of the built environment, the GUIC project with the young people of Braybrook, Melbourne, Australia compiled a list of potential design issues in their neighbourhood:

- unregulated places
- diversity of public spaces
- safe and secure meeting places
- flexible places in shelter
- variety in the dimension, size and malleability of places
- secure and safe corridors for moving around
- facilities which encourage, consolidate and allow identification and connection with the surrounding physical, social and natural environment.

As Malone and Hasluck (2002) conclude:

> "The findings provided extremely practical and valuable information regarding young people's information and use of the local environment – information that often countered official perceptions regarding young people's environmental needs and preferences" (Chawla 2002, p.86).

We are confident that our findings likewise contribute to the discussion of young people's perceptions of the built environment. Our activities begin to create a picture of what children and young people see in their local environs; the areas that bring comfort and enjoyment as well as fear and aversion. Using this snapshot of these local surroundings can then stimulate ideas to foster sustainable environments.

4.2 Opportunities within the built environment

After reviewing surveys, drawings, photo montages, and interviews, it appears that there are opportunities to engage students and teachers with the Design and Technology curricula. This can be achieved through encouraging observations of the built environment, enabling learning in the built environment, integrating

problem finding and/or posing, and incorporating sustainability into education. These opportunities can collectively enhance the integration of the design process.

Encouraging observations of the built environment

Often, technology education is presented as a discrete learning lesson disconnected from student's daily lives and experiences (Foster & Wright, 2001; Mawson, 2003; Fleer & Jane, 2004). Design activities, while engaging, may not relate to events beyond the school classroom. Teachers interviewed confirmed the importance of establishing learning and thus enquiry in the built environment in a context that is relevant, and meaningful, to the student. One teacher suggested the need to anchor learning in "…those parts of the built environment that are related to their lives. So, the skate parks, the sporting fields, the shops, their house. The school's important to them." (Teacher C). Relevance and meaning are linked to a student's experience of a particular situation or problem context. Teacher C considered relevance to stem directly from the extent of a student's experience. The difficulties associated with a student's understanding of a particular situation are a product of a lack of experience in the built environment. "They haven't experienced that in life yet. Those things that are important to them, well, they've experience with those things in the built environment" (Teacher C). Situating learning in a context that is perceived to be relevant and of meaning creates a link between problem solving in and out of the school (McCormick *et al*., 1994).

To situate learning describes a process that locates enquiry within the day to day reality of students, is considerate of what a student respects, is tangible to them and builds on their existing knowledge and understanding. In a design context, it involves the use of problem-solving strategies in everyday life. The incorporation of local surroundings provides a foundation and awareness for technological failures and successes. Local surroundings could be as close as the school. For example, a Randwick Boys HS student acknowledges the failure of the school car park. In a context familiar to him, he was able to make the following suggestion: "I would like to change the car park in to a tennise [*sic*] court and make the staff stop there cars on the road. So students that wanna play house tennise they can play right there." Students appreciate real world contexts (Hill, 1998; McCormick, 2004). By situating learning in the local built environment, teachers and students can be drawn into different perspectives of solving human problems.

Learning must be grounded in the concerns, needs and aspirations that each student has for their local built environment. The exploration of the built environment needs to be centred on a problem context that has been defined and constructed by the students, not by the teacher. An interviewed teacher reflected on the importance of students valuing and being engaged by what they are designing. "So if they're making something that I like, or it doesn't suit or relate to them, I think you're losing it a little bit" (Teacher G). Students must feel that exploration of the built environment is relevant to their world. Teacher G suggests that this is achieved by grounding their enquiry in a meaningful context: "I want kids to make it personal in one way or another." Furthermore, Teacher I stated that the problem context

cannot be abstract and "…needs to impact on them personally". Teacher K adds that this exploration "always has to have real-life application in it somewhere. Otherwise …they can't apply it. It doesn't take on any meaning. It's just schoolwork." Another respondent, Teacher F, went further and suggested that it was those aspects of their local built environment that derived "…some sort of pleasure and satisfaction" that were most engaging for students. School grounds can provide a context for enquiry in the built environment that is relevant, meaningful and has the potential to be experienced by all students.

In order for children and young adults to consider built environments, teachers and their curriculum need to introduce these concepts in a student centred context. When the built environment is considered an integral part of a young person's daily experience and is thus situated in a meaningful context, students have a better capacity to recognize a need or problem (Hill, 1997; Fleer & Jane 2004; Middleton, 2005). People think about problems in a context in which they are familiar. Many of the teachers interviewed suggested this is why the redesign of a student's bedroom is such an engaging design exercise. It situates the enquiry at a scale that is tangible and relevant to the student. This relevance and accessibility of the problem context fosters a greater capacity to engage in the problem solving process. Students should be directed towards making a connection between their existing knowledge with problem discovery to formulate design solutions (Jarvinen & Twyford, 2000). For example, a young cyclist from Kelso PS noted the discomfort of riding along the bike tracks. Recognising the pertinence of this discomfort, the student then suggested: "implant dirt in some of the dents and put a fence up." By engaging with real world challenges problems become authentic to the learner rather than artificially constructed tasks (McCormick, 2004).

Establishing real-world connections to learning may elucidate current knowledge generated at school. Real-world or authentic contexts for learning provide students with the opportunity to combine formal knowledge, experience, practice, and judgement. Moving from generic models of learning to content-bound and situation specific models shifts the focus from curriculum to instruction and situation where the student as learner plays an active role (Lewis et al., 1999). In our research, a Bossley Park HS student disclosed an aversion to the local swimming pool: "It's really disgusting when you're swimming to see band aids & people spitting into the water." The student can enhance this observation with references to health (disease potential of spit), sciences (band-aid adhesion) and technology (mechanisms to curb spitting). As such, students become active creators of their knowledge. Incorporating real world experience can generate new styles of learning and new opportunities to understand the built environment.

Technology is designed to meet "human needs." This is not meaningful to students unless students realize that these "human needs" incorporate their own needs and that they could design technological solutions to accommodate these needs (Murphy & McCormick, 1997; Benenson, 2001). Understanding the perceptions that students have about their needs in the built environment can strengthen design

education from a teaching and learning standpoint. This can extend beyond acknowledging the value of a student's immediate context as a teaching and learning tool (Teacher C), to clarifying the distinct nature of the relationship a student has with his local built environment. This research provides a snapshot of the nature of this relationship. It highlighted the affinity for and aversion towards elements in the built environment. In addition, students' emerging capacity to nominate changes reveal an awareness and opportunity to learn more about their human-constructed surroundings.

Enabling learning in the built environment

Challenges exist for teachers around the delivery of built environment concepts, not the nature of the content itself. Specifically, the design process is suited to presentation as a tool for enquiry, exploration and problem solving. Understanding the design process in this context perceives learning outcomes as related to a capacity for problem solving. The design process as a form of enquiry is not uniform. As Teacher J suggests:

> I would say *a* design process instead of *the* design process…it [the syllabus] says a design process to make the point to teachers that there's more than one. But the common thing here, the common thing we're on about is exposing kids to a range of options and giving them the knowledge so they can create their own options. That's what design is about.

The importance of building an understanding around a flexible design process is critical to encourage the variety of intelligences (Gardner, 2006) and learning styles inherent in students. Students possess a variety of aptitudes to express their ideas. Design ideas may be manifested through graphical, numerical, textual, and oral mechanisms (Kimbell *et al.*, 1996; Williams, 2000; Middleton, 2005). Williams (2000), cautions against presenting just one method to students regarding their communication of ideas. Not all students think the same, and given the influence of their prior experience, students have distinct capacities to learn and solve problems.

Of those teachers interviewed, many commented on the "hands on" nature of design and that this quality was its greatest asset in terms of attracting students. However, many students find the written component challenging. "They hate filling in the paperwork…they dislike that intensely" (Teacher K). A challenge exists to rethink how we document, reflect and appraise the outcomes of the design process and the mediums in which we do so. Students need to be engaged in determining how the outputs of their design enquiry are recorded and communicated. In that sense, the same excitement that is derived from more traditional "hands on" tasks can be generated by active engagement with new mediums of communication. Teacher J suggests that this reframing of paperwork relates to perceiving the Internet and other digital technologies as a part of the built environment. "There's also a virtual built environment that we're dealing with more and more on the Internet" (Teacher J). The processes of documentation may be multi-method and must provide greater flexibility for expression and communication of students' ideas. Students should be provided the opportunity and independence to think freely in their design procedures (Hill & Smith, 2005; Doppelt & Barak, 2002). This freedom

is linked not only to a level of flexibility within the design process but also to the opportunity for students to define the problem context and direct the enquiry process itself.

A fine balance needs to be struck between engaging students in a heavily structured and prescriptive design process and one that is dynamic, student centred and self directed. This balance must vary across stages of learning throughout the middle years. Early stages (year 5 and 6) tend to engage students in a more prescriptive process that becomes more self-directed and complex in later stages (year 7 and 8). Teachers discussed the challenge of fostering creativity through self-direction whilst needing to stage the iterative nature of the design process so as to navigate complexity. One teacher cautions against adopting an overly prescriptive approach to design education.

> I think we get locked up in this lockstep brief, analysis, research and the kids end up compartmentalising it. And I don't know that we are teaching them how to design when we just give them a recipe…when you give them a recipe, they follow the recipe. What do they really know? If you give somebody a recipe for a cake and you teach them how to make the cake, next week you can't ask them to make a cake because they'll need a recipe to do it (Teacher J).

Teachers remarked on the importance of a staged approach for engaging the early years given the length of the term and difficulty of "getting them to the end" (Teacher K). However, structure should not come at the expense of creativity and students need to be encouraged to "be creative and not be afraid to develop an idea that perhaps is not what they see everyday" (Teacher C).

Furthermore, many of the teachers interviewed also described the challenge of engaging younger students in building a spatial understanding associated with scale and 'big picture' enquiry.

> One of the great challenges we found, though, was that students have great difficulty with spatial understanding of that sort of concept, which is why we are looking at a more product-based approach (Teacher E).

In response to this challenge there is a tendency to engage younger stage students in product and object design then moving into larger scale built environment projects in later stages. Although, early stages are perhaps better suited to exploring the built environment to stimulate their creativity and draw on their capacity for lateral thinking. A stepwise approach to engaging students in the design process is required, although at each stage creativity and innovation can be fostered through a greater emphasis on self-directed enquiry in a context of relevance to the student.

The way in which students are engaged in the design process must respond to their change in capacity as designers as they progress their learning. Teacher J reflects that the consistent thread across those stages engaged in learning about design is the fostering of a problem solving capacity in students.

> You know, we teach kids to solve problems and that's the thing they take out of their subjects whether its woodwork or whatever. That's what they take out of it – the problem solving ability (Teacher J).

All teachers interviewed described significant challenges linked to delivery of the built environment syllabus. Teacher J suggests "I think boredom or otherwise is on the delivery rather than the topic". Teacher H reflected on their teaching and described a tendency to rote learning as being the biggest impediment to engaging young people in the built environment.

> Chalk and talk I call it. Putting work on the board and off they go writing in their books. I guess that doesn't really promote any enthusiasm and it leads to a very staid classroom (Teacher H).

Teacher D outlines the inherent suitability of more active approaches to content delivery. "But if you asked them to participate actively in whatever it was, then they'd be happy to do it. So I don't think they are bored of the built environment, I think it is the way…it is handed to them." In summary, Teacher J stated, "We design by designing. We learn about design by designing". Active approaches to exploring the built environment provides the opportunity for students to shape their enquiry, draw on prior experience and engage with a problem context that is of direct relevance and meaning to them.

Situating the learning journey

This research utilised drawings and photography as tools to elicit perspectives of the built environment and direct reflection towards built environment improvements. It engages with the challenge of identifying what is of interest to students in the built environment. "You know, it is really hard to measure their interest" (Teacher J). Understanding what aspects of the built environment are of interest to each student will assist facilitating students to identify a range of potentially meaningful problem contexts. The 'My place' and 'Our space' activities utilised with students in this research project provide insights into those objects of meaning in the built environment. However, these two activities may not be sufficient in directing possible solutions. For instance, through a drawing, a Bossley Park HS student revealed that "The pond is polluted but I don't know how to change it." Additional techniques such as outings to a healthy pond or lectures from experts can encourage development of this line of reflection, and ultimately, further enquiry. This also identifies opportunities for interdisciplinary explorations, eg between the Design and Technology and Science syllabuses.

Many opportunities exist to further support the engagement of young people in learning about, and in, the built environment. It is evident from the interviews with Teachers that there is an acute realisation that "…it is important for us to find a way to approach the built environment that really engages kids" (Teacher E). This research highlights numerous challenges associated with engaging young people in design and built environment education. These challenges are linked to the extent of resource support and to issues of delivery and the nature of enquiry.

A range of existing built environment education resources were audited to reflect on the holistic nature of enquiry fostered by each resource and to also highlight areas of strength to guide future resource development. Subsequently, an assessment framework was developed that utilises the Compass of Sustainability (AtKisson & Hatcher, 2001) and other criteria associated with delivery and pedagogy. It is based on the metaphor of a compass with four quadrants that all relate to provide an orientation towards sustainability: N = Nature, E = Economy, S = Society, W = Wellbeing. This framework may be used by resource providers to ensure that the nature of enquiry fostered by the resource is holistic and encompasses the full gamut of issues in the built environment.

Integrating problem finding/posing

Are problems teacher-imposed or inspired from observations by students? Teachers are often viewed as "repositories of technological problems" (Johnson, 1988; Lewis *et al*., 1997). Students should be provided more opportunities for problem finding to engage them in a holistic design process (Kimbell, 1994). The investigation process can include the act of problem finding. "Envisaging, putting the productive question is often a greater achievement than solutions of a set of questions…"(Wertheimer 1968, p. 141). Finding good problems is as important as solving them.

Problem posing education is based upon creativity and encourages reflection upon contemporary issues (Driver *et al*., 1994; Hill & Smith, 1998; Hatch, 1988; Hill & Smith, 2005). "Problems do not have to originate in textbooks; they can come from real life" (Lewis *et al*., 1997). The very line of enquiry a student takes in the built environment can emerge from their concerns, experiences and aspirations for it. For example, a Randwick Girls HS student was concerned for the accessibility of elderly people. Particularly, she focused upon her grandmother and the relationship between her grandmother's health and the level of accessibility of her house. "I'd change my grandma's house. I'd transform her house from light to the top to in the bottom because she's got knee and foot problems." Giving young people the flexibility to reflect on experience allows them to uncover their own problems and provide an avenue to suggest possible solutions. A continuous line of enquiry provides a myriad of opportunities to pose problems throughout the entire design process. As problem finders, students can become active participants in the design process, and in their own learning.

The nature of enquiry in the built environment refers to considerations of the 'what' or the identification of a meaningful problem context and the 'how' or the process of engaging with that context. Young people need to feel their 'voice' is valued and that they hold a valid perspective of problems and issues in the built environment. As discussed, key to this process is the freedom to construct problems that are of meaning and relevance to them. Of equal importance is the way in which young people are introduced and subsequently engaged with issues in the built environment. Many of the teachers interviewed describe the need to utilise more active forms of enquiry as opposed to those considered more passive. "Just

discussing the built environment" (Teacher C) is considered a passive form of engagement, where issues and processes of the built environment are explored remotely. Teacher B described the process of active enquiry where students exploring landscape design considerations for a courtyard by immersing themselves in the real world context provided by their schools library courtyard. "Within our landscape design unit we take the library courtyard and we think about traffic paths, the mood of the courtyard and how we can influence the mood by the types of planting, the aromas, the colours, the sizes and shapes" (Teacher B). Many Teachers suggested that an initial first step to transitioning to more active enquiry in the built environment would simply involve "…taking the kids for a walk around the school" (Teacher J). This active approach situates the student in the context they are exploring, and positions reflection on experience as the pathway for identifying the next steps in their enquiry.

Incorporating sustainability into education

The primary challenge for educators is linked to maintaining interest and commitment throughout the learning process. This is a challenge of generating 'significance' as described by the NSW Quality Teaching framework. Significance refers to those approaches to learning that generate "…clear connections with student's prior knowledge and identities, with contexts outside of the classroom, and with multiple ways of knowing or cultural perspectives" (NSW Department of Education and Training, 2003). Teacher E describes the challenge as:

> Getting us to come up with projects which address the built environment in a way that engages kids and forces us to think a bit more outside the square…and we're struggling with that concept now, trying to find something that engages the kids while still addressing something beyond just products that they are making or drawing (Teacher E).

Design and Technology assignments may be based upon problems identified in the local neighbourhood and relevant to the daily lives of students. Teacher E reflects on this need: "I just don't think that getting them to redesign abstract spaces is significant to them". Subsequently, it may be easier for students to consider the sustainability, aesthetic, cultural, safety, and functional issues of the surrounding built environment (Hill & Smith, 1998).

Sustainability is increasingly being considered to be a learning context in itself that also encourages connectivity across discipline silos. The current challenge facing all designers to realise sustainable development in their project work provides a bigger picture context to explore built environment issues that can generate significance for students. The potential for an activity to generate significance is enhanced when students feel that there is "a possibility of doing something" (Teacher B) and feeling that they have the capacity to contribute to positive change in the built environment. Young people need to feel that their time is not being wasted and that the learning process is a productive one, particularly when in other areas of design they are constantly producing tangible products. This sense of contribution and impact may be fostered through active engagement with key sustainable living challenges in their local built environment. Schools provide a

rich microcosm of the range of sustainability challenges issues in the built environment. This form of enquiry is promoted through the Commonwealth's Australian Sustainable Schools Initiative (Commonwealth of Australia, 2005) and aligned State Government activities.

As this project uncovered, students demonstrated an awareness of environmental problems occurring in their respective neighbourhoods. Students acknowledged: "Too many people litter," (Prairievale PS), "Cars…give air pollution to the school," (Bexley PS) and "Let's put the forest back into Forest Rd" (Sydney Technical HS). Not all environmental observations were problem oriented. A few were conscious of viable environmental solutions. A Bexley PS student recognised the value of solar panels while a Kelso HS student appreciated the aesthetics of a house because of its recycled materials. Nurturing all of these observations can bring both the student and teacher to enhanced levels of environmental reflection and opportunities for sustainable achievements. "By what is included or excluded, we teach students that they are part of or apart from the natural world" (Orr 1991, p. 4). Using their local surroundings as a learning laboratory, students can tease out the functions of their locality and transform these observations into sustainable solutions.

5.0 Future directions

This research has employed a series of research methods which modelled ways in which teachers could initiate learning activities within the built environment as part of their response to a broader Design and Technology syllabus. These are summarised in the following points:

- **The 'Our Space' drawing activity** provides the initial capacity to engage young people in considering their built environment and the objects of significance within it. By asking participants to consider potential problem contexts (or areas "they want to change") the activity can start to clarify pathways for further enquiry.
- **The 'My Place' photography activity** provides further capacity to start clarifying the nature of relationships participants have with significant objects in the built environment.
- **The 'built environment education resource audit'** provides a broad framework to assess the nature of enquiry and the extent of engagement with the breadth of issues within the built environment. It can be used to highlight potential content gaps or areas that require further support and resource provision.

This research has provided a snapshot of the understanding that children and young people have of the built environment. In doing so, it has clarified some potential next steps that aim to better engage young people in the built environment.

- **Incorporate active investigations of built environment issues in their local built environment.** Active enquiry, rather than passive enquiry, is effective at building interest and excitement around the problem context. Based upon their observations of their surroundings, have students identify potential problems/questions. Students are capable of generating their own questions when relating to scenarios, situations, and items that are familiar to them.
- **Encourage a variety of oral, graphic, and verbal mediums for students to express their design ideas.** A combination of methods can assist young people to communicate their ideas vividly and comprehensively in a way that is of interest and relevance to them.
- **Foster exploration of the built environment within the school grounds.** The real world challenges of a school in terms of its built environment provide an accessible and meaningful context for built environment enquiry. Considerations of improvements to these issues as 'design challenges' create an authentic problem context and may contribute to a sense of empowerment. High schools, in particular, noted their schoolgrounds as environments they would like to change.

- **Develop built environment education support materials.** Syllabus support materials are required that foster active and experiential enquiry and provide for student-centred problem finding and posing across all issues in the built environment that are able to be flexibly adapted by Teachers. This may range from teaching and learning sequences to case study posters that profile design challenges in the built environment across scales.
- **Foster peer learning, recognition and exchange around best practice built environment education.** The experience and knowledge of those teachers who are effectively engaging their students in the built environment is a great peer learning resource. Strategies that recognise leading teachers and provide a space for reflection and exchange are required that connects all primary and secondary education systems.
- **Create a directory of Built Environment Professionals available locally to support built environment education.** A central register of professionals across all built environment fields that are prepared to visit schools would provide teachers with greater support and access to specific industry/discipline areas.
- **Provide professional learning opportunities to schools.** Substantial opportunity exists for the provision of a range of professional learning services to schools that are high quality, discipline specific, engaging and flexible in their delivery format. Coordination is needed around the dissemination of these opportunities to all schools.
- **Integrate students' perspectives of the built environment into proactive design improvements.** Students' views and experiences of their surroundings can act as foundations for fruitful discussions towards sustainable change, whether based on school grounds or within the neighbourhood. Collaborations can be formed with various entities to transform ideas into meaningful results.

6.0 Conclusion

Students should "have the opportunity to bond with their surroundings, learn to love it, feel comfortable with it-before being asked to heal its wounds" (Sobel, 1996 p. 8). Before students can be asked to make improvements or alterations to the built environment, it is vital that we first understand the nature of the relationship they have with the elements and localities of their local areas.

This research has been concerned with advancing the understandings of school students' perspectives of human-made surroundings. The results of this study suggest that students have an awareness of the built environment and possess favourable views towards the places that they frequent and have experience in, namely: home, school, parks, and shops. Moreover, the activities in which we engaged the students provided a creative strategy to solicit the areas and objects that are meaningful to the students. The activities clarified the nature of the relationship the school students had with their built environment. The resulting student observations provide foundations for greater interaction with the local neighbourhood and community at hand. Active exploration of human-made structures whether in school grounds, or beyond to the local neighbourhood environs provides authentic learning opportunities for both students and educators alike. By encouraging insight into student's viewpoints, educators and practitioners can uncover those relevant issues in the built environment.

The nature of the research has provided a voice to those students and teachers that participated. It has demonstrated the importance and the value of giving students a voice and a more collaborative role in their learning process. In doing so, it reflects on the need to galvanise built environment professions and their leaders to consider how they can support the engagement of young people with the design challenges of the built environment.

7.0 References

AtKisson, A. & Hatcher, R. L. (2001) The compass index of sustainability: Prototype for a comprehensive sustainability information system, *Journal of Environmental Assessment Policy and Management,* 3 (4), pp. 509-532.

Banks, F. (Ed.) (1994) *Teaching Technology* (New York: Routledge).

Benenson, G. (2001) The unrealised potential of everyday technology as a context for learning, *Journal of Research in Science Teaching,* 38(7), pp. 730-745.

Chawla, L. (Ed.) (2002) *Growing up in an urbanising world* (United Kingdom: Earthscan).

Chidgey, J. (1994) A critique of the design process. In F. Banks (Ed.) *Teaching Technology,* (New York: Routledge) *pp*.89-93.

Christensen, P.M. & O'Brien, M. (2004) *Children in the City: Home, neighbourhood and community* (London:Taylor & Francis Group).

Commonwealth of Australia (2005) *Educating for a sustainable future: A National Environmental Education Statement for Australian schools* (Carlton, SA: Curriculum Corporation).

Doppelt, Y. & Barak, M. (1998) Pupils identify key aspects and outcomes of a technological learning environment, *Journal of Technology Studies*, 28, pp. 22-28.

Davies, T. (2000) Confidence! Its role in the creative teaching and learning of design and technology, *Journal of Technological Education,* 12(1) Accessed 14 May 2006 from <http://scholar.lib.vt.edu/ejournals/JTE/v12n1/davies.html>.

Driver, R., Asoko, H., Leach, J., Mortimer, E. & Scott, P. (1994) Constructing scientific knowledge in the classroom, *Educational Researcher*, 23(7), pp.5-12.

Fleer, M. & Jane, B. (2004) *Technology for children: Research-based approaches* (Frenchs Forest, NSW: Pearson Education).

Foster, P.N. & Wright, M.D. (2001) How children think about design and technology: Two case studies, *Journal of Industrial Teacher Education*, 38(2) Accessed 14 May 2006 <http://scholar.lib.vt.edu/ejournals/JITE/v38n2/foster.html>.

Gardner, H. (2006) *Changing minds: The art and science of changing our own and other people's minds* (Boston, MA: Harvard business School Press).

Hart, R. (1979) *Children's experience of place* (New York: Irvington).

Hill, R.B. (1997) The design of an instrument to assess problem solving activities in technology education, *Journal of Technology Education*, 9(1), pp. 31-46.

Hill, A.M. (1998) Problem solving in real-life contexts: An alternative for design in technology education, *International Journal of Technology and Design Education*, 8, pp. 203-220.

Hill, A.M. & Anning, A. (2001) Primary teachers' and students' understanding of school situated design in Canada and England, *Research in Science Education*, 31(1), pp. 117-135.

Hill, A.M. & Smith, H. A. (1998) Practice meets theory in technology education: A case of authentic learning in the high school setting, *Journal of Technology Education,* 9(2), pp. 29-45.
Hill, A.M. and Smith, H.A. (2005) Research in purpose and value for the study of technology in secondary schools: A theory of authentic learning, *International Journal of Technology and Design Education*, 15(1), pp.19-32.
Jarvinen, E.M. & Twyford, J. (2000) The Influences of socio-cultural interaction upon children's thinking and actions in prescribed and open-ended problem solving situations, *International Journal of Technology and Design Education,*10(1), pp. 21-41.
Johnsey, R. (1995) The design process – Does it exist? A critical review of published models for the design process in England and Wales, *International Journal of Technology and Design Education,* 5, pp. 199-217.
Johnsey, R. (1997) Improving children's performance in the procedures of design and technology, *The Journal of Design and Technology Education*, 2(3), pp. 201-207.
Johnson, S.D. (1988) Problem solving behaviour research model for industrial education, *Journal of Industrial Teacher Education*, 25(3), pp.29-40.
Jones, A. (1997) Recent research in learning technological concepts and processes, *International Journal of Technology and Design Education,* 7, pp.83-96.
Kimbell, R., Stables, K., & Green, R. (1996) *Understanding practice in Design and Technology* (Buckingham: Open University Press).
Kimbell, R. (1994) Tasks in technology: An analysis of their purposes and effects, *International Journal of Technology and Design Education*, 4, pp. 241-256.
Ladd, F. C. (1970) Black youths view their environment: neighbourhood maps, *Environment and Behaviour*, 2, pp. 64-79.
Lave, J. (1988) *Cognition in practice: Mind, mathematics, and culture in everyday life* (Cambridge: Cambridge University Press).
Lewis, T., Petrina, S., & Hill, A.M. (1997) Problem-posing- Adding a creative increment to technological problem solving, *Journal of Industrial Teacher Education*, 36(1). Accessed 14 May 2006 from <http://scholar.lib.vt.edu/ejournals/JITE/v36n1/ lewis.html.
Lynch, K. (1977) *Growing up in cities* (Cambridge, MA: MIT Press).
Malone, K. and Hasluck, L. (2002) Australian youth in Chawla, L. (Ed.) *Growing up in an urbanising world* (London: Earthscan) pp. 81-110.
Matthews, M. (1992) *Making sense of place: Childen's understanding of large scale environments* (Hemel Hempstead: Harvester Wheatsheaf).
Mawson, B. (2003) Beyond the 'design process': An alternative pedagogy for technology education, *International Journal of Technology and Design Education*, 13, pp. 117-128.
McCormick, R. (1997) Conceptual and procedural knowledge, *International Journal of Technology and Design Education*, 7, pp. 141-159.
McCormick, R. (2004) Issues of learning and knowledge in technology education, *International Journal of Technology and Design Education*, 14, pp. 21-22.
McCormick, R., Murphy, P. & Hennessy, S. (1994) Problem-solving processes in

technology education: A pilot study *International Journal of Technology and Design Education*, 4, pp. 5-34.

Middleton, H. (2005) Creative thinking, values and design and technology education, *International Journal of Technology and Design Education*, 15, pp. 61-71.

Murphy, P. & McCormick, R. (1997) Problem solving in science and technology education, *Research in Science Education*, 27(3), pp. 461-481.

Neumann, K. E. (2003) The importance of redesign, *Technology Teacher*, 63(3), pp.7-9. NSW Department of Education and Training (2007) Designing and making, Accessed 2 August, 2007 from <http://www.curriculumsupport.education.nsw.gov.au/primary/scitech/designproduce/index.htm>.

NSW Department of Education and Training (2003) *Quality Teaching in NSW public Schools: A classroom practice guide* (Ryde, NSW: State of NSW, Department of Education and Training).

NSW Board of Studies (2003) *Design and technology: Years 7-10 Syllabus* (Sydney: Board of Studies NSW)

Orr, D. (1991) What is Education for? Six myths about the foundations of modern education, and six new principles to replace them, *In Context*, Accessed 3 April 2006 <http://www.context.org/ICLIB/IC27/Orr.htm>.

Rogers, G. (1998) The designing stage of design, make, and appraise: A case study involving young children designing. Paper presented at the Australasian Science Education Research Association, Darwin, Australia.

Sobel, D. (1996) Beyond ecophobia: Reclaiming the heart in nature education (Great Barrington, MA: the Orion Society).

Stein, S.J., McRobbie, C.J. & Ginns, I. (2000) Recognising uniqueness in the technology key learning area: The search for meaning, *International Journal of Technology and Design Education*, 10, pp. 105-123.

Welch, M., Barlex, D. & Lim, H.S. (2000) Sketching: Friend or foe to the novice designer? *International Journal of Technology and Design Education*, 10, pp.125-148.

Wertheimer, M. (1968). *Productive thinking* (Chicago: University of Chicago Press).

Williams, P.J. (2000) Design: The only methodology of technology?, *Journal of Technology Education,* 11(2), pp. 48-60.

Woolley, H., Spencer, C., Dunn, J., & Rowley, G. (1999) The child as citizen: Experiences of British town and city centre, *Journal of Urban Design*, 4(3), pp. 255-282.

8.0 Appendices

A – Research team
B - Questionnaire
C – Interview schedule
D – ‘Our space’ drawing activity
E – ‘My place’ photography activity
F – Built environment resource audit
G – Example ‘Our space’ activity data
H – Example ‘My place’ activity data

APPENDIX A – FBEOutThere! RESEARCH TEAM

Linda Corkery – Project Applicant
Associate Professor, Landscape Architecture
Director, International and Community Engagement
Faculty of the Built Environment
University of New South Wales, Sydney NSW

Ben Roche – Project Leader
Manager, FBEOutThere!
Faculty of the Built Environment
University of New South Wales

Vivian Romero – Project Officer
Research Officer
FBEOutThere!
Faculty of the Built Environment
University of New South Wales UNSW

Andre Grant – Project Officer
Education Coordinator
FBEOutThere!
Faculty of the Built Environment
University of New South Wales UNSW

To contact the team by email: outthere@fbe.unsw.edu.au

APPENDIX B – QUESTIONNAIRE

This questionnaire is designed to gauge the extent and nature that teachers engage built environment issues through their teaching. It aims to provide an insight into: what aspects of the built environment are being taught; resources considered by teachers to be useful; pedagogical implications; impediments to built environment education; extent of experience outside of the classroom (work & PD); contextual issues.

1. How long have you been teaching?
   - 0 to 1 year
   - 2 to 5 years
   - 6 to 10 years
   - 11 years or more

2. Have you worked in other professions before teaching?
   - Yes
   - No

   If Yes,
   - How long had you been working prior to entering teaching?
     - 2 years or less
     - 3 to 5 years
     - 6 to 10 years
     - 11 years or more

   - What professions were you working in prior to teaching?

3. What professional development opportunities have you undertaken in built environment related areas in the past three (3) years?

4. What stage do you teach?
   - Stage 3
   - Stage 4
   - Stage 5

5. How much of your time is spent teaching Technology?
   - Less than a third of my time
   - About half of my time
   - More than half my time
   - All of my time

6. Do you teach about the built environment?
   - Yes
   - No

   If Yes,
   - What issues do you focus on when teaching?
   - What issues do you find it difficult to teach?

7. List three (3) resources that you find useful to teach about the built environment?

8. Do you teach from the syllabus?
   - Yes
   - No

9. Do you use the school surroundings in your teaching?
   - Yes
   - No

APPENDIX C – INTERVIEW SCHEDULE

The interview is designed to explore the thoughts and experiences of teaching about the built environment. It will provide an insight into the barriers to teaching the built environment, whilst also highlighting effective strategies and techniques. The interviews will take approximately 35 minutes and the audio will be recorded.

Pre-interview

- The study is focused on taking a snapshot of the understanding that children and young people have of the built environment.
- By built environment we mean those aspects of our surrounds or environs that have been made by humans.
- We want to find out from teachers what your thoughts and experiences are of working with built environment related subject areas within the technology key learning area.
- The information we compile through the study does not focus on the quality or state of technology teaching in NSW – that is we are not assessing you or your teaching in any way.
- Important to ground the study in the realities of the classroom and to draw on your experience and knowledge to situate our conclusions.

Interview

1. To what extent do you teach Technology?
    - *How much of your week do you spend teaching technology?*
    - *How long have you been teaching technology for?*
    - *What inspires you about teaching this subject area?*

2. What areas are you teaching from the built environment?
    - *Do you teach from the syllabus?*
    - *What aspects of the built environment do you find difficult to teach?*
    - *What do you consider to be the biggest barriers to teaching the built environment?*
    - *What resources have you found to be useful to assist teaching the built environment?*

3. What aspects of the built environment do you feel students are most interested in?
    - *What potential is there to further engage this interest? Any ideas?*
    - *What aspects of the built environment do you feel students are least interested in?*

4. How do you talk about creativity in relation to the built environment with your students?
    - *How do you think this relates to the design process?*
    - *How do you teach design and design process?*

5. What are some of the successful activities that you have undertaken with your students?
    - *To what extent do you use the school surroundings and the wider community in your teaching? Of the built environment specifically?*
    - *How is this valuable?*

APPENDIX D – 'OUR SPACE' DRAWING ACTIVITY

This exercise will allow students to demonstrate a level of geospatial capability and an ability to describe and recall landmarks within the school grounds and surrounding area. It asks students to consider potential problem contexts and steps they may take to improve it.

The activity sequence involves:

1. Activity kits sent to schools with instructions for each of the teachers on how to run the exercise (the research team will touch base with all teachers to ensure they have received the kits and that they feel comfortable with their role);
2. Teacher then briefs students on the activity;
3. Students will be asked to *create a map of the school and surrounding areas, highlighting those things that you consider to be important*. The drawing will be done on A2 paper in the medium of their choosing, although we suggested coloured textas;
4. Students will then be asked to code their drawings with a member of the research team present: *indicating the areas they like, the areas they do not like, and those things that they would like to change;*
5. Students will be asked to record why they would like to change the object/area that they nominated;
6. Students complete their drawing activity during the research team's visit; and,
7. The research team will collect the coded drawings on their first visit and return them to the school within a reasonable time frame.

APPENDIX E – 'MY PLACE' PHOTO ACTIVITY

This exercise will gauge students' understandings, perceptions, attitudes and appreciation of their everyday built environments in their neighbourhood.

The activity sequence involves:

1. On the first visit, the research team will distribute and introduce the photo activity;
2. Students will be asked to *take photographs around your neighbourhood of those things that are important to you and that you like*. The students will be asked to imagine that they are using the photos to show their neighbourhood to a new friend. The assignment will take place over a week;
3. To identify the owner of the photos and to demonstrate use of the cameras, each student will be instructed to take the first photo of himself or herself.
4. Once the assignment is complete, teachers will collect the cameras and send the cameras in the provided postage paid box to the film processing plant;
5. The film processing plant will return the printed photographs to the school;
6. Teacher brief students on next steps of activity;
7. Students will be asked to select the best images to make into a poster (A2 size) with labels describing each of the images. Students will be asked to *explain briefly why you like these places and find them important*. They can use a variety of methods (narrative, poem or other creative piece);
8. For the second visit (of the research team), students will exhibit their posters and share their written pieces with each other and discuss any interesting aspects as a class; and,
9. Posters will be collected by the research team and returned to the school within a reasonable time frame.

APPENDIX F – Built Environment Education Resource Audit

Overview

The aim of the resource audit was to identify current leading resources that are easily accessible to teachers and educators interested in built environment education. These resources are available in print (book or kit) and electronic (CD Rom or online) forms. A snowball sample process was used to identify key resources and included the following approaches:

- informal surveying of course convenors in pre-service technology training centres;
- desk research;
- data collected form semi-structured teacher interviews with selected schools; and,
- data collected from email based questionnaires.

Sourcing of resources for the audit was not limited to those produced in Australia. Resource samples were obtained from Canada, the United Kingdom, and the United States. Selection criteria were developed to assemble the resource samples into a shortlist. The resource samples were assessed according to the following selection criteria:

- Is this an educational tool (i.e. what is the level of ease of instruction?)
- Is the resource reasonably related and targeted to design and technology subjects in the target age range?
- Does the resource explore the built environment explicitly?
- Does the resource explore the built environment implicitly?
- Is it easily accessible and available?

Once the shortlist was amassed, these resources were further subjected to audit criteria. Each resource was analysed for its exploration and presentation of the design process, interpretation and definition of the built environment, and the inclusion of variety of educational approaches.

Furthermore, each resource was examined for how it framed and positioned sustainability as a concept. Sustainability can provide a real world context that can bind all design considerations within the built environment. A focus on lifestyle, personal and social amenity of the built form can simultaneously address concerns of sustainability (i.e. personal, local, and global significance). To consider the breadth of sustainability issues was considered to be a wholistic line of enquiry in the built environment.

Developed by Alan AtKisson and R. Lee Hatcher (2001), the *Compass of Sustainability* is a potent tool for assessing and breaking down sustainability. It is based on the metaphor of a compass with four quadrants that all relate to provide an orientation towards sustainability: N = Nature, E = Economy, S = Society, W = Wellbeing. It extends the triple bottom line approach as it separates and makes

explicit society and wellbeing considerations. That is, it acknowledges personal lived experience as well as broader community scale issues associated with social capital. The Compass of Sustainability has a myriad of applications from strategic planning and assessment for entire nations (e.g. the Baltic 21 group of nations) through to orienting curriculum for sustainability. It is also a particularly effective tool that assists designers to proactively respond to sustainability at the initial conception stage, rather than as a superficial regulatory afterthought.

Reflections

1. **Design Process**
    - Each resource considered the design process. Design processes are generally staged and structured. They incorporate a diversity of components: investigation, research, ideas development, reflection, design development, testing, evaluation, model- making.

2. **Built Environment**
    - The built environment is defined in a multitude of ways throughout the resources. The interpretation of the built environment ranges from an introductory perspective of buildings, towns, and cities to more complex interpretations including service provision, transport and communication systems, resource use and provision, cultural expression of built form, and social infrastructure. Most resources use the contrast and interaction between the natural and the human-made environments to assist in definition. Finally, a few of the resources encouraged participants to collectively form a definition.

3. **Educational Approaches**
    - Learning strategies vary across resources but are generally collaborative, learner-centred, and experiential. Examples include: group discussions, reflective diaries, mind mapping, and role playing. The most common strategy included an "urban safari" where students explore and analyse their local built surroundings.

4. **Sustainability Considerations**

    Based upon the *Compass of Sustainability* (AtKisson & Hatcher, 2001), the following strengths and weaknesses are generalised:
    - **Nature:** well covered in all resources and often used as the anchor for sustainability issues.
    - **Economy**: generally not well addressed as design criteria. Where it is considered, it is often found integrated with social amenity and access to commercial infrastructure.
    - **Society:** generally very well developed and interpreted widely as social amenity and community building. Most resources explore the interaction between people, culture, community and their built environment as a focus. This may be how resources are directing significance to the learning.

- **Wellbeing:** not often dealt with as a discrete concern outside of social amenity. However, many resources focus on lifestyle, heath impacts and aesthetic sense of place. Again, this is where significance is enhanced in most resources as connections are made to real life experiences of student interactions within the built environment.

Resources selected

Subjected to the aforementioned analysis, the following resources demonstrate leading educational strategies which incorporate the built environment, design process, and concepts of sustainability.

Board of Studies, NSW. (1996) *Appropriate technology – designing the future* (Sydney: NSW Board of Studies).

Board of Studies, NSW. (1991) *The best place to live: the services and products in our community* (Sydney: NSW Board of Studies).

Commission for Architecture and the Built Environment, UK (CABE). (2006) *Creative spaces: improving school design* (London: CABE).

Commission for Architecture and the Built Environment, UK (CABE). (2006) *Getting outthere: art and design local safari guide* (London: CABE).

Department of Education Training, NSW. (2006) *The living land* (Ryde: NSW Department of Education & Training).

Harriman, S. (1996) *Carrots kits and traffic lights* (Carlton: Curriculum Corporation).

Harriman, S. (1996) *Design it, make it, appraise it* (Carlton: Curriculum Corporation).

Intermediate Technology Development Group. (2001) *Wall to wall design* (Rugby: Practical Action).

Landcom. (2006) *My neighbourhood* (Sydney: Curriculum Corporation).

Learnscapes Trust, NSW. (2006) *Hands on Learnscapes* (Ryde: NSW Department of Education & Training).

Royal Australian Institute of Architects. (1998) *Your house: built environment education package* (Manuka: RAIA).

TIPS/Harriman, S. (1996) *Kids design challenge* (Carlton: Curriculum Corporation).

Wesley, A. (2004) *Technology by design* (South Yarra: Macmillan Education).

Title	***Appropriate Technology - Designing the Future***				
Author/Publisher	***NSW Board of Studies***			**Resource Format**	*Hard Copy Kit*
Origin	*Australia*	**Year of Publication**	*1996*	**State**	*NSW*
Description	*An extensive teaching kit including book, CD and VHS video. This resource explores the role of technology in creating a just and sustainable world. Emphasises the social , environmental and cultural contexts of technology by focusing on the concept of 'Appropriate technology'. Built upon a range of activities designed to fit the NSW curriculum.*			**Stage**	*3 & 4*
Interpretation of Built Environment	*Provides an overview of all technolgies that exist in our built environment but does not explicitly distinguish built environment technologies as a separate topic. However, the resource does explore a range of issues related to urban design, buildings and housing and associated technologies throughout the book.*				
Interpretation of Design Process	*Design process is modelled from the Design, Make and Appraise or DMA process. In application, the DMA process incorporates four stages: Investigating, Devising, Producing and Evaluating. Central to this resource is the critical analysis of technology and design. As such, the development of criteria and evaluation of technolgy are inherently explored as key aspects of the processes of design.*				
Educational Approaches	*As a teaching guide, the book focuses on the role of nature and technology education. There are activity ideas thoughout the second half of the resource. Within these activities, the approach is enquiry-based and student-centred. The resource aims to develop critical questioning skills around the application of technology to assess its level of 'appropriateness'. Learning strategies include, design tasks, role play, group discussions, class discussions and active science experiments.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*Very High*	*High*	*Very High*	*Very High*	
Comments	*Has an emphasis on ecological sustainablility as a key component of 'appropriate technology'.*	*Emphasises economic aspects of the application of technology to improving quality of life. Explores financial impact of technologies on communities.*	*Resource focuses heavily on the social and cutural context in which technology is developed and applied. Strong emphasis on poverty reduction and social justice.*	*Has emphasis on design for human scale, inclusivity, technology for self reliance, and increasing quality of life. Resource grounds the development of technology in issues of human wellbeing.*	
Weblink	*www.bos.nsw.edu.au*		***Contact***	*service@bos.nsw.edu.au*	
Address	*117 Clarence Street, Sydney NSW 2000*				

Title	***Carrots kites and traffic lights***				
Author/Publisher	***Susan Harriman***			**Resource Format**	*Hard Copy Booklet*
Origin	*Australia*	**Year of Publication**	*1996*	**State**	*National*
Description	*A teaching resource in the form of a book aimed at supporting innovative and creative approaches to the delivery of upper primary technology education. Published by the Curriculum Corporation, this resource responds to a national statement and curriculum profile for technology education as opposed to a specific state curriculum. Contains 5 units of work with a range of student-centred and open-ended activities.*			**Stage**	*3*
Interpretation of Built Environment	*Built environment forms a significant component and context for this resource. Built environments are interpreted as urban environments explicitly but are also addressed as landscape designs in the form of garden design processes. Built environment is not used as a term specifically, however, a distinction is made between natural environments and those 'made or organised by people'.*				
Interpretation of Design Process	*The design process is explicitly interpreted and simplified as three stages of Design, Make and Appraise or DMA. In application, the DMA process is expanded to four stages of Investigating, Devising, Producing and Evaluating. Evaluation and appraisal processes, however, are built in as regular features in most activities and stages of the process, rather than a distinct phase at the end. Collaborative design processes are identified and encouraged.*				
Educational Approaches	*The resource aims to situate learning and build significance by building relevance to day to day lives in its choice of three focus areas. The learning approaches are identified as student-centered and open-ended and centred around design tasks. Tasks are enquiry-based, self-directed activities that explore a range of adaptable learning strategies - from drawing, excursions, mindmapping and group discussions to model making and reflective processes.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*Low*	*Low*	*Medium*	*Low*	
Comments	*Addressed primarily in issues of water. Environmental considerations are not predominant or explicitly identified as a concern or context.*	*Economic aspects of technology are not specifically dealt with.*	*Societal application of technology is explored as a central focus. Social amenity, application and function of technology is implicit.*	*Issues of wellbeing are not specifically dealt with other than the significance of technology to the individual student.*	
Weblink	*www.curriculum.edu.au*		***Contact***	*sales@curriculum.edu.au*	
Address	*St Nicolas Place, 141 Rathdowne St, Carton, Vic, 3053*				

Title	***Creative Spaces: Improving School Design***				
Author/Publisher	*Commission for Architecture and the Built Environment (CABE), UK*			**Resource Format**	*Website*
Origin	*UK*	**Year of Publication**	*2006*	**State**	*N/A*
Description	*A website produced by the Commission for Architecture and the Built Environment (CABE), UK. The resource explores school design as a built environment learning activity and targets stages 3 and 4. The site aims to build an appreciation of built environment issues by exploring the challenges of school design and construction techniques. The focus of this resource is on how the UK should design and build 'schools of the future'. CABE has a range of other resources and case studies that are of relevance on their website.*			**Stage**	*3 & 4*
Interpretation of Built Environment	*Interpretation is not explicitly dealt with in the learning process. Built environment is not defined, however, this resource emphasises buildings and construction techniques with links to cultural influences and social amenity of built environments.*				
Interpretation of Design Process	*A design process is used as the basis for learning throughout the website. Students are guided through a staged process of researching and investigating existing design, historical and cultural influences on school design followed by problem identification, ideas generation and design. The design process is explictly identified as: investigating the problem, project research, project production. Within these sections are various subtasks including, identifying contexts and issues, designing , making, evaluating and testing.*				
Educational Approaches	*Approach is predominantly a website directing the process of enquiry. Students work through online content and activities individually with the aim of developing a coursework portfolio containing research and various designs for a school of the future. Activities are generally independent, self-directed, and research-based.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*High*	*Low*	*Medium*	*Medium*	
Comments	*Covers a range of sustainability issues through ecological design. Explores materials lifecycles, energy use, water use and solar passive design.*	*Explores economic issues in construction and design process but does not link this to sustainability.*	*Considers social context of design quite effectively. This program explores connection between design, culture, sustainable communities and educational theory.*	*Considers personal interaction with built environment through aesthetic impact on individual experiences as a result of design. Does not identify this as a sustainability issue explicitly but does explore in some detail.*	
Weblink	*http://www.ncw.org.uk/creativespaces*		**Contact**	*http://www.cabe.org.uk*	
Address	*CABE 1 Kemble Street London WC2B 4AN*				

Title	***Design it, Make it, Appriase it***				
Author/Publisher	*Susan Harriman. Published by the Curriculum Corporation*			**Resource Format**	*Hard Copy Booklet*
Origin	*Australia*	**Year of Publication**	*1996*	**State**	*NSW*
Description	*A resource book containing 6 units for lower secondary technology teaching. Includes detailed teacher notes and worksheets exploring design of spaces (interiors & landscape), food production, mass production , media technology & products. Emphasis on design process.*			**Stage**	*3 & 4*
Interpretation of Built Environment	*Not explicitly mentioned or identified but has 2 units relevant to built environments; one on designing a kitchen as an interior design and another on micro-farming as a potential landscaping project.*				
Interpretation of Design Process	*The book is designed to assist teachers to integrate design process as a learning scaffold and classroom practice in technology education. Instructs and provides tools for teachers to facilitate design skills in students.*				
Educational Approaches	*Positions the design process as a structured enquiry-based learning process as a tool for best classroom practice. The design it, make it, appraise it, process builds in active learning, sometimes experiential learning, and a reflective process of evaluation.*				
Sustainability	**Nature**	**Economy**		**Society**	**Wellbeing**
Emphasis	*Medium*	*Low*		*Low*	*Low*
Comments	*The resource integrates design considerations in each unit that requires students to mitigate for environmental impacts but does not explore this issue in any detail.*	*Does not consider economic issues of design, but does consider some issues in marketing and distribution. Makes no connection to sustainability.*		*Explores integration of culture in design but makes no connection to issues of sustainability.*	*Explores the role of the client in the design brief and process but does not make connections to issues of sustainability.*
Weblink	*http://www.curriculum.edu.au/catalogue/product.php?cat_id=357*		*Contact*	*sales@curriculum.edu.au*	
Address	*Curriculum Corporation* *PO Box 177* *Carlton South* *Curriculum Corporation, PO Box 177, Carlton South, Victoria, 3053*				

Title	***Getting Out There: Art and design local safari guide***				
Author/Publisher	*CABE: Comission for Architecture and the Built Environment*			**Resource Format**	*Hard Copy Booklet*
Origin	*UK*	**Year of Publication**	*2006*	**State**	*N/A*
Description	*A guide to using the local built environment at key stages 3 and 4. This resource is a guide to exploring and interpreting the local built environment through excursion. Contains a range of tools and activities for identifying key features of the local architecture and urban design.*			**Stage**	*3 & 4*
Interpretation of Built Environment	*Built Environment is defined explicitly as: '…includes buildings and the spaces between them. It embraces the built form, natural world and people' . Interpretation is focused on human-made urban structures and landscapes .*				
Interpretation of Design Process	*Does not explore design process explicitly but rather looks at identifying design features in the existing built environment. The emphasis is on interpreting and scoping built environments rather than a discrete design process.*				
Educational Approaches	*Most activities are experiential learning through active engagement with local environment. Process is enquiry-based and critically framed. Learning strategies are predominantly graphical and visual arts based in a technological context.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*Medium*	*Low*	*Very High*	*Very High*	
Comments	*Environmental considerations are limited to 'environmental quality'. Environmental impact and sustainable design not explicitly explored or considered.*	*Not explicitly mentioned or explored.*	*Strong emphasis on social amenity and sense of place. Strong emphasis on designs and their interaction with human and social functions. Aesthetics are explored as a core topic.*	*Emphasis os sense of place and aesthetic values of built environments. Human interaction with space and personal or emotive responses are explored.*	
Weblink	*www.cabe.org.uk*		*Contact*	*enquiries@cabe.org.uk*	
Address	*1 Kemble street London, WC2B4AN*				

Title	***Hands on Learnscapes***				
Author/Publisher	***NSW Learnscapes Trust, NSW Department of Education and Training***			**Resource Format**	*Cd-Rom*
Origin	*Australia*	**Year of Publication**	*2006*	**State**	*NSW*
Description	*This is a CD containing six units of work that assist educators to design landscapes around the school grounds that are active and experiential learning environments. This resource also has linked video segments and examples of 'learnscape' plans.*			**Stage**	*3 & 4*
Interpretation of Built Environment	*Explicitly considers the interaction between the built and natural environments as a core theme throughout the units and materials. Uses the school and the grounds to situate the learning while exploring the concept of built and natural environment.*				
Interpretation of Design Process	*Focused on collaborative and participative design process involving students in the process of designing innovative learning landscapes around school. The design process is explicit, iterative and reflective.*				
Educational Approaches	*Uses design process as an enquiry-based learning process to achieve learning outcomes in landscape architecture.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*High*	*High*	*Very High*	*High*	
Comments	*Explores issues of water harvesting, native species, biodiversity,solar access, food production and permaculture.*	*Considers affordability of design in the process to allow schools to create a realistic design that they can afford over time.*	*Emphasises designing learning environments that are interactive and inclusive of people.*	*Has strong emphasis on designing for sense of place and wellbeing.*	
Weblink	*www.learnscapes.org*		***Contact***	*www.learnscapes.org*	
Address	*Available in all school libraries NSW*				

Title	***Kids Design Challenge: Built Environment Challenge***				
Author/Publisher	***TiPS - Susan Harriman***			**Resource Format**	*Website*
Origin	*Australia*	**Year of Publication**	*2004*	**State**	*NSW*
Description	*A stage 2 initiative run by Technology in Primary Schools (TiPS) teacher's group under the auspices of the NSW Professional Teachers Council. The scenario has been developed for Stage 2 students, however the website and associated resources can be used for stage 3 teaching. The Built Environment Challenge encourages students and teachers to work in the community beyond the school, to consider the needs of people other than themselves in redesigning an aspect of their local built environment.*			**Stage**	*3*
Interpretation of Built Environment	*Interpretation is well developed and discussed extensively in support materials found on the website. In summary, the built environment has been interpreted as our human made environments that include - buildings, cities, towns, farms, interiors, services and transport and communications infrastructure. Built environments provide shelter, food and safety as well as express ideas, culture, and beliefs. Built environments are complex interconnected systems that reflect culture, society, history and technological development.*				
Interpretation of Design Process	*Interpreted as a staged process on enquiry and idea development. The design challenge integrates a staged process of enquiry as its learing and design process. In this way, the program does not distinguish between the learning and design processes.*				
Educational Approaches	*The program is a single activity based design task. The approach is highly student-centred around a group enquiry process. The learning strategies within the design challenge are based around group work and active engagement with real world context and problem solving in their local area and around the school grounds. Problem identification, ideas generation, design and evaluation are facilitated within the design process as reflective learning tools. Students involve themselves in group discussion, map-making, mind-mapping and presentation of ideas. Students may then actively make physical changes to their built environments.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*Medium*	*Low*	*High*	*Low*	
Comments	*Introduces sustainability as an emerging environmental consideration for resource use and its impact on the natural environment.*	*Considers cost and availability of materials within a local economy as important.*	*Explores links to culture and community. Asks students to consider their community (school community and beyond) quite extensively within the design/learning process. Identifies the needs of people as central to the design task.*	*Does not separate individual needs and wellbeing issues distinctly from community or 'people's needs.' Does not explicitly link these to sustainability.*	
Weblink	*http://www.ptc.nsw.edu.au/kdc/built/index.html*		***Contact***	*tips_kdc@tpg.com.au*	
Address	*N/A*				

Title	***My Neighbourhood***				
Author/Publisher	*Landcom and NSW Department of Education and Training, published by the Curriculum Corporation.*			**Resource Format**	*Website*
Origin	*Australia*	**Year of Publication**	*2006*	**State**	*NSW*
Description	*A web-based learning object with supporting teacher notes and units of work. The resource was developed by Landcom to support the teachings of built environment issues in stage 2. However, the tasks would be easily suited to early stage 3 students. Activities focus around exploring and designing urban form. Student explore their neigbourhood and using the online learning object, design and test imaginary neigbourhoods.*			**Stage**	*3*
Interpretation of Built Environment	*Resource does not define built environment but rather addresses this as an open-ended group discussion activity at the beginning. In this way, the resource establishes students' prior knowledge and develops a consensus on its intepretation.*				
Interpretation of Design Process	*Learning process is integrated with the design process as a staged sytem of enquiry, ideas generaration, design and evaluation.*				
Educational Approaches	*Approaches are predominanltly enquiry-based and to some extent student-centred. Structured reflection is incorporated as well as activites to ground learning in students' prior knowledge (particularly in interpreting the built environment). Activities centre around designing built neighbourhood form. Learning strategies include: local excursions, role play, mapping, group dicsussion, word banks, mind mapping, reflective discussions and learning logs.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*Low*	*Low*	*Very High*	*Medium*	
Comments	*Environmental issues are identified as a concern in terms of sustainability. However, these issues are not predominant in the resource.*	*Economic issues are explored to an extent by addressing service and community economic infrastructure in design and enquiry processes.*	*Heavy focus on social amenity and community building. Resource focuses on how we build functional active communities. Role of various community stakeholders are extensively explored.*	*Addresses issues of wellbeing indirectly through exploring lifestyle and aesthetic issues.*	
Weblink	*http://www.landcom.com.au/mini-sites/my_neighbourhood/index.htm*		*Contact*	*Landcom social sustainability program social.sustainability@landcom.nsw.gov.au*	
Address					

Title	***Technology by Design***				
Author/Publisher	*Arna Wesley, Macmillan Education Australia*			**Resource Format**	*Hard Copy Book*
Origin	*Australia*	**Year of Publication**	*2004*	**State**	*NSW*
Description	*A technology text book produced to support stage 4 technology mandatory syllabus in NSW. The resource explores the full range of focus areas of the syllabus in detail providing student activities following each topic. Published by Macmillan Education Australia.*			**Stage**	*4*
Interpretation of Built Environment	*Interpreted according to the NSW technology mandatory syllabus definition, the built environment encompasses 'space, place and use' and 'the environments people build'.*				
Interpretation of Design Process	*Interprets design process as being context specific. Identifies distinct stages but does not prescibe a sequential progression through these stages. The resource emphasises that designing can be a cyclic process with many iterations. Stages may be revisited and repeated in a variety of orders depending upon the nature of the project. Leaves design process open to interpretation while providing a range of differing models.*				
Educational Approaches	*Approaches are text book based but the resource provides many opportunites for design tasks to be developed from the various topic areas explored. Activities are not provided in detail but imply class discussions, individual work, local excursions and design tasks.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*Very High*	*High*	*Very High*	*Medium*	
Comments	*Has a well developed exploration of environmental issues imbedded throughout the resource in all focus areas. Sustainability is often interpreted as an environmental design criteria.*	*Explores vocational roles of designers as well as economic considerations in design processes. Does make links between economy, lifestyle consumption and sustainability.*	*Ethical and social dimensions of the impact of technology are well presented and developed throughout the resource.*	*Makes a link between sustainability and preserving quality of life. Occasionally explores impact of design on the individual as well as lifestyle issues.*	
Weblink	*www.macmillan.com.au*		*Contact*	*N/A*	
Address	*Macmillan Education Australia pty Ltd, 627 Chapel Street, South Yarra, 3141*				

Title	***The Best Place to Live: The Services and Products in our Community***				
Author/Publisher	***NSW Board of Studies***			**Resource Format**	*Hard Copy Booklet*
Origin	*Australia*	**Year of Publication**	*1991*	**State**	*NSW*
Description	*A unit of work developed by the NSW Board of Studies to support K-6 Sceince and Technology syllabus. Unit comprises of 10 key tasks exploring design and resource use of urban environments, housing and buildings in general. This unit has an emphasis on built environment infrastructure, resource use and environmental impacts.*			**Stage**	*3*
Interpretation of Built Environment	*Presented explicity as the environment built by humans. The unit focuses on how towns, houses and buildings are serviced and consume resources.*				
Interpretation of Design Process	*Not explored or mentioned as a component of design. Activities do not draw out or work through a design process.*				
Educational Approaches	*Approaches are predominantly enquiry-based, though not heavily student-centred. Tasks are not developed in significant detail. Learning strategies include: excursions, model making, self directed research, class and group discussion, resource audits and hands-on science experiments.*				

Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**
Emphasis	*High*	*Medium*	*Medium*	*Medium*
Comments	*Explores resource use and environmental impacts extensively. Explores impact of built environments on natural environments especially in relation to water, waste and energy consumption.*	*Identifies economic issues as a consideration in outcomes and draws these out in detail through exploring local government services and income generation in 'servicing a town' activity.*	*Explores governance issues to some extent and explores impacts of access to community services but does not specifically emphasise social impacts and contexts.*	*Not explicitly explored other than through issues of safety in the home and lifestyle in exploring local community.*

Weblink	*http://www.boardofstudies.nsw.edu.au/*	***Contact***	*service@bos.nsw.edu.au*
Address	*117 Clarence Street, Sydney NSW 2000*		

Title	***The Living Land***				
Author/Publisher	***NSW Department of Education***			**Resource Format**	*Downloadable PDF*
Origin	*Australia*	**Year of Publication**	*2006*	**State**	*NSW*
Description	*A Connected Outcomes Groups (COGs) cross-curricular unit of work downloadable from the NSW Curriculum Support website. The unit explores natural built and heritage environments of Australia. The resource is structured as a teaching and learning sequence integrated with key syllabus across the curriculum.*			**Stage**	*3*
Interpretation of Built Environment	*Natural and built environments identified explictly as interconnected spheres. Built environment interpreted as buildings, housing and urban form including landscape. Relationships and impact of built environment to natural environment investigated as key theme of resource.*				
Interpretation of Design Process	*Students research, explore, critically evaluate and develop a design process through engagement with unit. Design process is not prescibed but negotiated with students as part of the learning process itself. Key design process stages are implied with reflection and evalution central to the structure of investigation. Design tasks and processes are located specifically in the science and technology aspects of the unit.*				
Educational Approaches	*Approach is student-centred and enquiry-based. Learning strategies include drama,dance, photography, art, musical performance, design evaluation and design tasks (energy efficient house design), group discussions, class discussions, exploration of the school grounds, map making and writing tasks.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*Very High*	*Medium*	*High*	*High*	
Comments	*Examines environmental impacts and ecological sustainability of housing and urban design. Energy efficiency of housing design and energy issues explored as central focus.*	*While economic issue are not directly explored, the educational processes may draw out these issues within activities and discussions.*	*Explores values and attitudes of students and society toward natural built and heritage environments while exploring aspects of civic participation.*	*Explored as issues of lifestyle, safety, environmental heath. Impacts of environments on individuals explicitly identified as a topic for consideration.*	
Weblink	*http://www.curriculumsupport.education.nsw.gov.au /timetoteach/cogs/uows3/livingla_s3au.pdf*		**Contact**	*http://www.curriculumsupport.education.nsw.gov.au*	
Address	*3a Smalls Road Ryde NSW 2112*				

Title	***Wall to Wall Design***				
Author/Publisher	*Intermediate Technology Design Group - Practical Action.*			**Resource Format**	*Hard Copy Booklet*
Origin	*UK*	**Year of Publication**	*2001*	**State**	*N/A*
Description	*A resource pack exploring sustainable housing design. The resource has a particular emphasis on 'Appropriate Technology' and housing design for environmental, social and cultural sustainability. Using a comparison between traditional Maasai housing designs in Kenya and housing in England the resource explores the design process in detail. The resource is integrated with UK design and technology curriculum for stage 3 and has a strong emphasis on materials used in construction.*			**Stage**	*3*
Interpretation of Built Environment	*Takes a wholistic view of sustainability in relation to built environment issues. Does not identify with built environment as a term but deals with social, cultural, economic and environmental issues in their relation to individual housing design.*				
Interpretation of Design Process	*Learning about the design process is central to the focus of this resource. The resource places an emphasis on an inclusive design process that explore the needs of people, society and the environment. Design process is identified as a staged process with the development of a design brief as a key focus.*				
Educational Approaches	*The resource allows for degrees of student-centredness but is fairly prescriptive in guiding student completely through the enquiry processes. Design and make tasks are included; however, the major emphasis is on learning about the design process through the class activities and handouts.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*Very High*	*Medium*	*Very High*	*Very High*	
Comments	*Explores environmental issues primarily through materials use. Does explore solar passive design, energy and water use, embodied energy and lifecycle issues.*	*Explores affordability of housing as a sustainability criteria. The resource also touches on fair trade issues.*	*The resource has a heavy emphasis on social and cultural issues.*	*Has a strong emphasis in lifestyle, health, wellbeing and quality of life issues. This is particularily prevalent when housing is linked to creating sustainable livlihoods for Maasai in Kenya.*	
Weblink	*http://practicalaction.org/?id=resources_catalogue*		**Contact**	*practicalaction@practicalaction.org.uk*	
Address	*The Schumacher Centre for Technology & Development Bourton on Dunsmore RUGBY CV23 9QZ United Kingdom*				

Title	***Your House: Built Environment Education package***				
Author/Publisher	*Royal Australian Institute of Architects*			**Resource Format**	*Downloadable PDF*
Origin	*Australia*	**Year of Publication**	*1998*	**State**	*National*
Description	*A downloadable PDF format education kit for middle and upper primary. The resource may also be suitable for lower secondary. The resource covers a range of 6 key topics including the local neighbourhood form, materials, indigenous housing, architectural styles, environmental impacts, future built environment form and sustainability.*			**Stage**	*3 & 4*
Interpretation of Built Environment	*Primarily interpreted as an urban environment with an emphasis on architecture, housing design and urban form.*				
Interpretation of Design Process	*The design process is explicitly dealt with as an introductory activity and is separated into 6 distinct phases of enquiry and development. The phases include: design brief, design brief analysis, site analysis, concept/sketch design, design development and documentation.*				
Educational Approaches	*Approaches are reasonably student-centred and focused around learning activities that explore concepts in architecture and built environments. Key learning strategies include: group discussions, local excursions, map making design tasks and hands-on activities. The kit aims to guide students actively through an extensive range of technical content on architectural housing design.*				
Sustainability	**Nature**	**Economy**	**Society**	**Wellbeing**	
Emphasis	*High*	*Medium*	*High*	*Medium*	
Comments	*Explored implicitly and explicitly throughout the resource as design considerations form all aspects of design from materials selection to passive and active design. Explicitly focused on in "Impacts" topic area.*	*Economic considerations are balanced with environmental and social impacts and explored explicitly in "Impacts" topics area and in other topics.*	*Extensive- with an emphasis on exploration of cultural context of housing design and urban form. The "Impacts" topic area explicitly covers the social impacts of different urban and housing design.*	*Not identified as a core theme but is touched upon in some sections as lifestyle and heath impacts.*	
Weblink	*http://www.architecture.com.au/i-cms?page=57*		*Contact*	*national@raia.com.au*	
Address	*Level 2, 7 National Circuit BARTON ACT 2600 PO Box 3373 MANUKA ACT 2603Level 2, 7 National Circuit BARTON ACT 2600 PO Box 3373 MANUKA ACT 2603*				

APPENDIX G – EXAMPLE 'OUR SPACE' ACTIVITY DATA

APPENDIX H – EXAMPLE 'MY PLACE' ACTIVITY DATA