

# An urban informatics approach to smart city learning in architecture and urban design education

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**Abstract.** This study aims to redefine spaces of learning to places of learning through the direct engagement of local communities as a way to examine and learn from real world issues in the city. This paper exemplifies Smart City Learning, where the key goal is to promote the generation and exchange of urban design ideas for the future development of South Bank, in Brisbane, Australia, informing the creation of new design policies responding to the needs of local citizens. Specific to this project was the implementation of urban informatics techniques and approaches to promote innovative engagement strategies. Architecture and Urban Design students were encouraged to review and appropriate real-time, ubiquitous technology, social media, and mobile devices that were used by urban residents to augment and mediate the physical and digital layers of urban infrastructures. Our study's experience found that urban informatics provide an innovative opportunity to enrich students' place of learning within the city.

**Keywords:** Urban informatics, architecture, urban design, university education, tertiary education, smart city learning, guerrilla research tactics, place-making, community engagement

## 1 Introduction

The city provides a place for work, commerce, politics, exchange, cultural opportunities, and much more. In this study we examine how the city has been used to transform the *space* of learning into a *place* of learning for architecture and urban design students. A space of learning is transformed into a place of learning through the experience of people. A space of learning refers to the environment in which learning occurs. The place of learning shifts from merely the container of the learning activity to the actual situated learning experience in which students are embedded.

This paper discusses two case studies undertaken in collaboration with South Bank Corporation in Brisbane, Australia, and academics and students at Queensland University of Technology (QUT). The project is funded by a QUT Engagement Innovation Grant that focuses on developing relationships between the university,

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students, and local community partners to promote innovative community engagement approaches. The central learning objectives addressed by the project are urban informatics including new media and digital tools in community participation approaches, place-making techniques, and engagement and innovation of knowledge creation through design processes.

The focus of this paper is to discuss the students' experiences as major participants and contributors to this project, and how their role has shifted from a space of learning to a place of learning within the city. Participating students were from a 4th (final) year architectural design class and a Master of Design (Urban Design) research class in 2012.

In the fields of urban design and architecture, the notion of place is fundamental to design approaches. Investigating and promoting the notion of place for the local community within the South Bank area of Brisbane was a primary goal throughout the scope of this project. In a learning context, the question of place also becomes critical as we examine the quality of the experience that our students obtained through actively combining design thinking, urban technology, and place-making in the city.

Applying real world issues and scenarios is fundamental to the transition between spaces of learning to places of learning for urban design and architecture students. Students were initially exposed to the issues of the Grey Street areas of South Bank which underwent a rejuvenation initiative led by the corporation's place manager. They had the opportunity to interact with South Bank staff and local community members to gather empirical data to help analyse local issues. Students then responded to these issues through the design of architectural solutions and urban design proposals. Students had the opportunity to present their ideas to local community members at a public exhibition featuring poster displays and debate.

Our study aims to redefine and redesign places of learning through the direct engagement of local communities as a way to examine and learn from real world issues in the city. This research can be regarded as a pilot project of smart city learning, where the key goal is to promote the generation and exchange of ideas surrounding the urban issues of South Bank that will inform the creation of new design policies responding to the needs of local citizens. Specific to this project was the implementation of urban informatics techniques and approaches to promote innovative engagement strategies. Students were encouraged to review and appropriate real-time, ubiquitous technology, social media, and mobile devices that are used by urban residents to augment and mediate the physical and digital layers of urban infrastructures. Our study's experience found that urban informatics provide an innovative opportunity to enrich students' place of learning within the city. Students' experience of place should include a combination of formal and informal learning spaces, as well as hybrid learning spaces [1] that blend digital and physical means of participation, towards better smart city learning outcomes.

## **2 Literature Review**

Our study is guided by two aims: First, we want to explore and evaluate innovative approaches to better engage architecture and urban design students in tertiary

education, and in turn, to improve their learning outcomes. Second, we want to find best practices to tie university education with real world projects that provide an applied way to combine teaching and learning with research. Both of these aims are being investigated and trialled using urban informatics, digital technology, social media, and mobile and location-based services and devices as conduits and means to deliver our aims as empirically tested outcomes. The following section will critically review previous scholarship in these three areas: pedagogy, civic engagement, and urban informatics.

## **2.1 Pedagogical Framework**

The question of how Information and Communication Technologies (ICTs) affect and influence higher education is ever present in day to day operations common to university learning environments and academic research. As part of the case study evaluated in this paper, a constructivist approach [2] to tertiary education has been applied where the lecturers are more facilitators than depositors of knowledge. Biggs and Tang [3] advocate the capacity for students to independently source information as an essential skill.

In the curriculum design of these classes an awareness of how students employ technology has been taken into account when creating relevant content and thus making delivery more effective [4]. The pedagogical focus for the educators involved in this project has been to assist students in gathering, evaluating and elaborating data which is a skill not as common to students as assumed [5, 3]. A flexible approach to the teaching as suggested by the constructivist theory has been relevant to the two case studies discussed. The learning advocated has been a student centred activity where students were able to customise their learning process [2]. The teaching within these classes is based on Reiner and Willingham's [6] suggestion that teaching styles should match the topic being taught. Therefore, the focus of the classes has been to augment the traditional on-campus formal teaching facilities and the use of ICTs with a strong focus on the city itself as a learning place. Supported by research suggesting that the brain engages different areas while performing different tasks [7], students were encouraged to explore and compare the physical, social, and digital qualities of urban environments. As a response to external stimuli and specific activities, changes in students' behaviour was promoted [8] through on site investigations questioning the influence of physical, social, and digital experiences to place.

The importance of the students' engagement through direct participation throughout their learning process [9] was stressed through close mentorship by teaching staff. The teaching style focused on providing direction to and detailed feedback on the students' learning. This process allowed them to reflect on their experiences of urban environments and modify their developments [10]. Within the learning environments of these case studies, different types of presentations, media, formats, locations, and modalities were employed to engage different senses continually refreshing students' interests [11].

The main goal of promoting the city as a place of learning through community consultation has been to develop students' approach to urbanism and architectural design as reflective practitioners [12, 13, 14].

## 2.2 Learning Space vs. Learning Place

Traditionally, university teaching occurs in formal learning environments such as lecture theatres, tutorial rooms, and laboratories while the form and capacity of these learning environments dictates the teaching that happens within them [15]. Jamieson et al. [15] stress that previous research in the area of learning environments has focused on students' learning experience and the teaching approach. The concern has not been directed towards the relationship between the design of physical environments and their creation of places of learning. Jamieson et al. [15] therefore argue that there is a strong connection between the quality of the learning environments and the experience of place affecting learning outcomes and student success. Although on-campus teaching and learning environments, which include both digital and physical environments, occur in physical place, the incorporation of ICTs has affected the teacher / student relationships to it [15].

Kolb [16] defines a *“general description of place as an extended location where the perceived (physical or virtual) expanse is linked to norms and expectations for appropriate or inappropriate actions”* (p. 126). Places, including digital places, are where actions and expectations and norms are found [16]. Therefore, it is not the design of learning spaces that create learning places, it is how they are used and what meaningful actions occur within them that create effective learning places. Learning places need to encourage and allow for self-reflection and development [16]. Part of the process in the transition from a space to a place is the ability to push the rules for individual expression and inhabitation. As educators we need to provide environments that are comfortable, where students can take risks and challenge their preconceptions while learning new modes of critical thinking [16].

It is through the exposure of real world urban sites and issues that this study has focused towards shifting the space of learning to a place of learning in the smart city context.

## 2.3 Civic Engagement

In the disciplines of urban design and architecture, it is imperative to consider the social, environmental, and economic contexts in which they exist. Site specific analyses are critical to good design approaches and processes. As part of a site analysis, focus needs to be given to how people utilise place [17].

Around the world, civic engagement is paramount to promoting democracy and equity throughout urban planning, policy reform, and design [18, 19]. Through civic engagement, urban planners and designers are able to consolidate a variety of local perspectives into their knowledge base which in turn informs planning, design, and policy outcomes. This process also generates interest and support from local stakeholders, therefore assisting the implementation process and increases democratisation of decision making [20, 21].

Problematic to current engagement processes are increasing concerns of political motives and bureaucracy. This is due to the perception that civic engagement does not provide adequate representation of public interests being limited in scale and scope [22]. The use of technology within civic engagement and public consultation is a



possible solution by providing opportunities for a more diverse range of local stakeholders that can be invited to participate in the process. The use of technology and its ubiquitous nature, has the potential to encourage a wider range of participation through the sharing of information [23, 24].

At present there are many available applications, platforms and services that provide and encourage participation through the sharing of information such as social media (Facebook, Twitter) and interactive blogs (Tumblr). When applying these tools to community consultation it is possible to encourage the public to share their understanding and perceptions of design, policy, and planning issues [23 – 25]. In different urban global environments new tools and practices are changing the ways in which urban planners seek information to achieve socially sustainable outcomes [23, 24].

It is the combination of technologically rich tools and traditional engagement methods that are explored within the South Bank project to acquire a diverse range of information from the local community and to reach out to community members and stakeholders that have been hard to reach via conventional means. The urban design students who participated in this project pushed the limits of available tools with positive results in terms of increased civic engagement.

## **2.4 Urban Informatics & Guerrilla Research Tactics**

The use of urban informatics has the potential to increase accessibility and efficiency of civic engagement. Urban informatics is characterised by being ubiquitous, accessible, and dynamic allowing for collective decision making to occur at large scales within urban environments [26]. Contemporary urban environments are prolific with complex infrastructure such as communication networks, information technology, building complexes, transportation networks, and urban inhabitants all of which can be examined through the use of urban informatics to gain deep insights into how our cities operate. It is urban informatics that communicates these networks into tangible information allowing for the digital and physical layers of urban environments to be better understood [27, 28].

Guerrilla Research Tactics (GRT) are a combination of participatory action research [29 – 31] and unobtrusive research methods [32] to enhance social research [33]. The primary characteristics of GRT are that covert tactics are developed for attracting and engaging with research participants typically when acquiring data from the public is usually challenging using conventional means. The GRT methods can employ physical artefacts containing digital links to online data collecting resources such as an online poll or survey that can also be distributed through social networks. A creative approach to data acquisition is encouraged to develop fun and engaging research methods. GRT focuses on engaging with local communities to question critical social and urban issues that require action by the public to propose solutions [33].

The urban design students combined urban informatics and guerrilla research tactics to engage with the South Bank project and local communities to acquire empirical data relative to the themes of their chosen research assignments.

## 2.4 Smart City Learning

Tim Campbell, author of *Beyond Smart Cities* [34], states that learning occurs in the minds of people who are interested in taking action and who care about the cities where they live. Campbell claims that the most active learning cities create methods to facilitate the creation, sharing, and acquisition of new ideas to assist in solving local urban problems.

The city is at the centre of public, private, and civic networks and has the ability to proactively promote and develop networks while encouraging the interaction between and amongst local and global talent [34]. City learning is viewed as a collective process where individual citizens and stakeholders begin to learn from others leading to the adoption of ideas by wider groups such as neighbourhoods, businesses, and local councils [34]. Learning occurs on multiple levels one of which being when new ideas are acquired by examining how something works within the city. Another level is the sharing of values that are accepted based on trust – “*the acceptance of the idea itself is a form of innovation*” [34, p. 5]. When neighbourhood ideas are heard and accepted at a city level, changes to policy occur or the innovative application of a practice or technology are implemented [34].

According to Gil-Castineira et al. [35] smart cities researchers bring together interests from a range of disciplines including urban planners, sociologists, governments, and ubiquitous-computing researchers.

## 3 Methodology

In this study two groups of students were exposed to South Bank as an area of investigation in either a final year bachelor course in architecture or a masters course in urban design. Each of these classes focused on transferring the space of learning outside the typical classroom to a place of learning in the urban environment. During each class the approach varied as a response to the context and needs of the curriculum being taught, however, all students were examining and participating within the same part of the city: South Bank, Brisbane.

### 3.1 Case Study #1: Master of Urban Design Students

The Master of Design in Urban Design students participated in this study through a mandatory class. The focus of this class was to explore research methods appropriate for urban designers. After discussing the role of place from a design perspective, students were asked to explore the area of South Bank and to consider the design challenges that Grey Street – South Bank’s main street – currently faces. In alignment with the strategic priority of South Bank Corp., students were asked to question how the Grey Street area could be improved, activated, linked, and enriched in order to assist in repositioning South Bank as a cultural precinct that provides an extension of Brisbane’s central business district.

The class comprised twenty students who were placed into four groups of five. As part of these groups students identified one key urban design issue to research further.

For the first part of the semester students conducted literature reviews and explored digital tools for data acquisition. Along with the concepts of urban informatics and Guerrilla Research Tactics, four key research tools were introduced by the teaching team; an online survey platform, an online polling platform, a rich media blog platform, and a digital screen with a discussion platform that allowed users to text or tweet short answers to a specific question [36, 37]. These methods were initially trialled by the students on campus. Students had to evaluate the tools and propose which methods would be developed further for field work at South Bank. As the projects progressed students were encouraged to share ideas and developments with each other during class time. Through the combined effort of the students it was found that they had identified twenty four different digital and physical approaches to engage with the community for data acquisition. Students were encouraged to also develop their own combination of community engagement approaches.

The four teams of students identified different issues and approached each set of issues in innovative ways. Students were encouraged to use their background and interest in design to develop creative and fun ways of interacting with South Bank users. Two of the student groups created design interventions which combined physical and digital methods. One group developed their own digital mapping application, and the other relied on a digital survey platform linked to YouTube. In all of the projects social media such as Facebook and Twitter were used to promote data collection in an attempt to further diversify the data pool.

### **3.2 Case Study #2: Final Year Architecture Students**

Approximately sixty students from the 4th (final) year Architectural Design class were asked to use a site and design brief provided by South Bank as an area for architectural development. Students were placed into three separate tutorial groups with three different tutors for the length of the semester. South Bank Corp. provided a relatively detailed design brief stating zoning and coding requirements for the site along with some guidelines according to what the building design had to satisfy. The brief stated that the building had to provide a means for income generation and engage with the local community. An example provided to students was a library with a small bookstore. Students were encouraged to explore the program further and were asked to redevelop the brief according to their site investigations.

During the first half of the semester, students were required to conduct thorough site and context analysis. Students then considered who the future users of their design building would be. Therefore, it was imperative for students to first observe the site and its surroundings which they did using a range of tools and methods. Many of the students relied heavily on online sources in addition to their own observations.

At the end of the semester representatives from South Bank Corp. attended the design presentations to provide feedback on the proposals. A presentation was also given to the South Bank board of directors which highlighted 15 student architectural proposals.

In November 2012, a combined exhibition of the architectural designs and the urban design research outcomes was conducted at a vacant shop on Grey Street. Industry partners, the local community, students, academics, and South Bank Corp. representatives attended the exhibition. The purpose of the exhibition was to expose

the design ideas from the different groups of students to all of the stakeholders involved. The exhibition provided an engaging and useful [38] opportunity for students to gain further feedback and insight from the stakeholders regarding their design proposals.

## 4 Findings

### 4.1 Case Study #1: Urban Design Students

The Master of Design in Urban Design students who participated in this project employed a range of traditional and contemporary engagement methods to interact with the South Bank local community to investigate urban design problems within the South Bank precinct. Students actively conducted field trials and critically examined their research process with the final outcome being a minimum of a final report in a conference paper format, an A2 poster summarising their research project, and any additional materials they found useful to complement their project's findings.

#### Team A

Team A examined the 'Great Ideas for Grey Street' program which South Bank Corp. had initiated to explore how to create Australia's great cultural boulevard. The team identified a physical and visual gateway, the Ernest Street Railway Underpass (ESRU) into the Grey Street and South Bank precinct as shown in Figure 1, as an important entrance and node [39] that contains little amenity or desirable public space. The ESRU is a critical entry and pathway connecting the South Bank precinct to the railway station, the South Bank Tafe, and Brisbane State High School. The team explored theories from Lynch [39] examining the roles of the urban landscape as something to be delighted in while questioning the success of place.



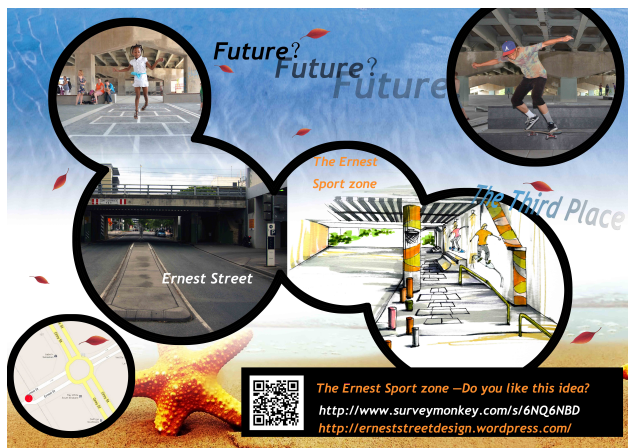
**Fig. 1.** The Ernest Street Railway Underpass (ESRU) is shown to depict its connection to Grey Street.

In the team's report they state, "*in assessing the ESRU the team identified the importance of creating something loved by the community in order for it to be sustainable and successful*". To examine this further the team focused on

Oldenburg's [40] definition of the '*third place*,' a setting outside of home or work which people frequently visit to relax and enjoy the company of others, as a proactive design lens to question the ESRU through. The goal for this team was to provide a meaningful way to engage with the local community by asking what their perceptions and ideas for a third place at the ESRU would be. Acknowledging that traditional community consultation methods tend to alienate users through fixed attendance and location, the team introduced ICT methods into their community consultation approach. These methods were identified as a way to encourage a variety of opportunities for passive and active engagement from a diverse population base. The following methods were implemented to acquire both qualitative and quantitative data.

Team A developed a WordPress website as the central platform for their engagement process acting as a front door to the information regarding their research information including; project description, consultation times, survey links, research team information, and ethical clearance documentation. The website was linked to all visual materials through the use of a QR code. The website was also distributed via email and through social media networks such as Facebook.

In addition to the website, Team A developed a 'live' and analogue engagement method called the 'Mural Wall' to facilitate interaction from the public users (Figure 2). Fundamental to the design of the Mural Wall was the illustration of potential third place ideas for the ESRU area through a fun and creative manner. The Mural Wall consisted of five hand drawn vignettes expressing options for the development of third place designs for the ESRU; the Ernest Arts, Ernest Street Garden, Ernest Street Market, Ernest Street Sports, and Ernest Rumpus. The team interacted with participants asking them to vote for their preferred design option through the use of sticky dots and notes.



**Fig. 2.** Team A combined hand drawn vignettes and images to attract research participants.

The team tracked 142 views on the website. The Mural Wall had 332 dot votes from 166 unique participants. Observations from the mural wall indicate that the people who participated with it wanted to quickly vote and move on, there were few

people who stayed on to write comments on the sticky notes provided. Participants were asked to use red (stop) or green (go) dots to vote on which vignette design they liked or disliked.

The team employed two types of surveys; survey A and survey B. The surveys provided an online consultation method. Survey A ultimately questioned what elements from South Bank should be incorporated in the redesign of ESRU area or what was missing from South Bank that should be included in the creation of third place at ESRU. To inform ongoing consultation processes it questioned how the survey was encountered and what motivated participants to respond to it. Survey A was distributed through the website, QR codes on the Mural Wall, A2 posters at the ESRU area with a weblink and QR Code, social media, and flyers were distributed to Mural Wall participants. Survey A had twelve participants.

Survey B was attached to each vignette design proposal aimed to gather direct information from participants about the specific type of third place they would enjoy, whether people would visit to use the space, and what their favorite aspect of the design was. Survey B had forty participants in total.

The overall findings from the team's analysis conclude that the Mural Wall provided clear and distinct results showing that the preferred option from the participants was the Ernest Street Garden and the least favorite was the Ernest Street Markets. The surveys indicated that people associate third place with cafés or parklands during weekend mornings and weekday afternoons. Overall the methods suggest that people enjoy third places which provide comfort and that people would like to see these qualities in the ESRU area. The surveys also confirmed that the favourite design option by participants was the Ernest Street Garden and the least was the Ernest Street Market.

The engagement methods were consistent with each other helping to provide a clear direction for Great Ideas for Grey Street and the ESRU redesign. Participants stated that they would engage in additional community consultation if they could see that their input influenced the design outcomes.

The team established the project to be a meaningful exercise and particularly found the online consultation to be informative. Team A stated that increased data collection could be found by aligning consultation with major events at South Bank.

## **Team B**

Team B conducted a study to uncover the perspectives of local residents and users on the creation of the Cultural Boulevard. The research focused on ideas for turning the Queensland Conservatorium inside out allowing for the cultural experience provided by the building to be experienced on the street by passers-by on Grey Street. The qualitative research methods used by Team B was a combination of social media, photo sharing, online and manual surveys, and onsite interaction with participants using YouTube projections.

The four aims of the survey was to; identify the participants interaction, use and enjoyment of the cultural institutions along Grey Street, understand the ranging perceptions of culture by different users, explore the definition of a cultural boulevard through the creative expression of images from participants, identify the perception of the cultural institutions and how their identity can be improved and accessed through the pedestrian experience along Grey Street.

A Facebook page was used as a central site for the project which included links to the online survey and photo sharing options. Facebook allowed for users to give feedback via likes and comments. This Facebook page was connected to other Facebook groups such as the Gallery of Modern Art and the Queensland Conservatorium. The Facebook had 14 'likes' by public users.

Photo sharing was encouraged by the use of a Facebook Page, Instagram, Tumblr, and Twitter. There were 4 photo shares recorded. A YouTube video was used to display a concert that occurred inside the Queensland Conservatorium to display to participants the type of cultural event that happens inside the building. The YouTube video was linked to the online survey. The same video was played on site through a projector onto the Conservatorium wall for onsite participants to observe while addressing the survey.

The online survey with the YouTube clip and an image of the Queensland Conservatorium was distributed through social networks and Facebook pages. This survey had 41 online responses. Manual surveys that were conducted on site had 91 responses.

From the photo sharing contributions participants used photographic images from other parts of the world to express ideas as to what could be done to Grey Street. One image in particular displayed Exhibition Road in London as an example for shared access within a cultural precinct.

The overall findings from the survey indicated that 49% of onsite survey participants were not aware of what occurs inside the Queensland Conservatorium. The user experience on Grey Street can be improved through direct connectivity with the cultural buildings by allowing artificial dinosaurs, sculptures, and artworks to be displayed outside with the aim of encouraging people to enter and interact with the buildings. Three main user types were identified; local residents, students, and workers, each group having different needs and perceptions of the Grey Street area. The majority of participants agreed with the concept of Grey Street becoming Australia's great cultural boulevard. People expressed that they were interested in what occurs inside the buildings. A summary of the results can be seen in Figure 3.

Participants suggested an improvement for the sharing of communication and information regarding the cultural institutions and their events through a dedicated Facebook page or the creation of a mobile application for the cultural precinct as a whole.



**Fig. 3.** Team B summarised their results and research strategy in this poster.

**Team C**

The focus for Team C was to explore the public perception of physical, social, and technological connectivity throughout the South Bank precinct to improve the understanding of South Bank users and their movement around the area.

The aim of the research methods was to maximise public participation by combining a range of tools including; location based social media (Facebook), mobile based social media (Twitter), physical mapping analysis, spatial mind mapping (e-participation), onsite observations, onsite questionnaires, and onsite mapping.

Surveys were conducted through a central website that was promoted through a Facebook Page, Twitter, and social networks. In addition to this the team engaged with survey participants onsite while also distributing flyers with QR codes linking to the online survey as shown in Figure 4.





**Fig. 4.** This poster developed by Team C reveals the mapping exercises they focused on in their research process.

Based on google maps API v3 a web-based application was developed by the team to be used by participants to collect map-based responses to journey, destinations, and places of interest. The mapping exercise was followed by the online survey. The key findings from Team B's investigation recorded 77 attempts to complete the survey over a 3 week period. The results of the survey show that participants were more concerned with physical connectivity than social or technological connectivity.

The overall response from participants was that physical access around the South Bank precinct was perceived to be good. It could be improved through the use of more maps and signs, more car parking, accessibility information, and improved public transportation such as a monorail. Walking was determined to be the most popular mode of transport throughout South Bank. Facebook was found to be the most successful method of acquiring responses to the online survey. To analyse the mapping data path intensity and heat maps were created by the students to reveal information such as the most frequent paths taken, a comparison between online and analogue mapping results, difference in route selection based on gender, locations participants tend to avoid, and locations that were most visited.

Team C's reflections on the research project indicate that the mapping application development takes more time than anticipated. The team also stated that the production of visual data sets were more useful in the analysis of information than initially perceived. The team was able to appreciate the opportunities for the use of digital tools and media as part of the planning process to augment traditional consultation methods.

*"A logical extension of these digital tools is the use of online mapping, as a means of allowing participants to express their ideas visually and geographically. The use of*

*mapping tools also leads to the potential for interesting visual representation of data, both to SBC and on display within the public realm” – Team C.*

Ultimately the team concluded that the information collected through their research along with traditional public opinion will increase the understanding into how the public views connectivity of South Bank with the larger Brisbane city context.

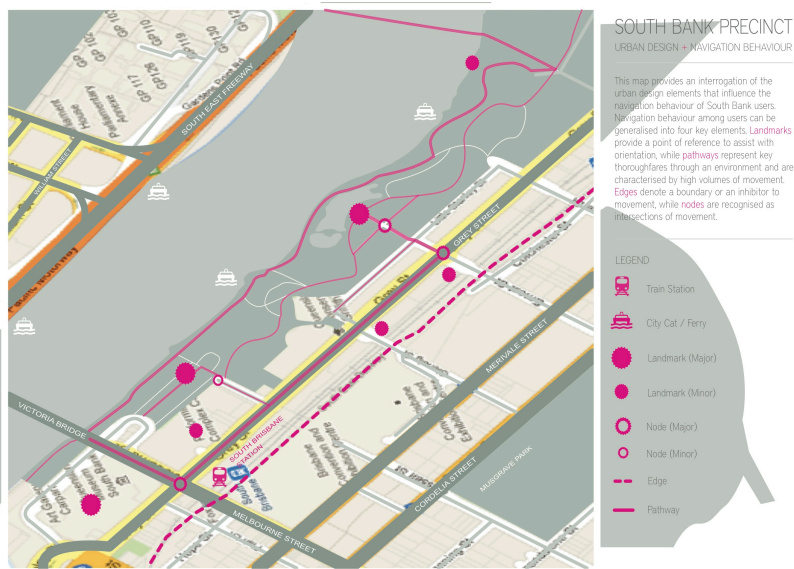
#### **Team D**

The main objective for Team D was to explore the design elements that influence the navigation behaviour of South Bank users. Three public engagement approaches was applied. In data collection 1 ‘Mapping the image of South Bank at major transit hub,’ the team members used blank sheets of paper to prompt participants to sketch their ‘image’ of South Bank, encouraging participants to draw the area as if giving directions to someone. Data collection 2 ‘Mapping the image of South Bank, the Footpath Chalk experiment,’ used similar instructions to participants as in data collection 1, however participants were asked to draw using chalk on the footpath along Grey Street, Data Collection 3 ‘Mapping your journey through South Bank on Google Maps,’ involved team members along Grey Street approaching participants with an iPad to answer an online survey and a digital mapping exercise.

Analysis of data collection 1 and 2 involved placing the sketches into a series of categories based on the frequency of Lynch’s [39] elements such as; edges, nodes, landmarks, and paths. The aim for the drawing activities was to capture people’s perception of design factors that influence how participants move through South Bank.

There were 16 participants in total for data collection 1 and 2. In the drawings it was found that the Brisbane Eye – the local Ferris wheel – was the most prominent feature, included by 81% of the participants. Grey Street was the second most popular element included in 50% of the drawings. Distinctive elements of South Bank were reference points included in the drawings such as the man made beach and Little Stanley St.

For data collection 3 approximately 50 participants interacted with the iPad digital mapping activity. Common influential landmarks, major pathways and frequent nodes around the South Bank precinct were identified by the majority of participants, refer to figure 5. Paths that were poorly lit or railway underpasses that are perceived as uncomfortable were avoided by pedestrians. A sense of safety was indicated by participants as an important element to the South Bank area where 75% of participants indicated they felt safe in the area during day or night. There is a large public presence throughout most areas which promotes the sense of safety. Overall, students determined that although these elements are important on their own it is the integration of them which determines the design success of South Bank as a precinct.



**Fig. 5.** Team D summarised the key landmarks, nodes, edges, and pathways identified by South Bank users.

Based on their research findings, Team D provided some recommendations for design consideration. Inter-precinct connectivity is identified to be weak and can be improved through the redesign of railway underpasses to improve the link with suburbs to the east. Opportunities exist for landmarks to be included in the quartiles of South Bank that would also aid in navigation throughout the precinct.

The team reflects on how the use of South Bank as a real world site allowed them to gain another dimension in their educational experience, *“as academics it often becomes habit to become entrenched in theory of particular concepts and fields, yet this sandpit approach to real world scenarios each graduating students is likely to encounter in the workforce added an additional experiential dimension”*. Because the class was tied to the demands of an external client the research projects students created had to adapt to the constraints and limitations of real world scenarios, *“the group found the project did grow each in a professional capacity, perhaps more so through the limitations and obstacles in delivery than if it had been a seamless process from start to beginning”*. Overall the group’s understanding of how the profession operates as part of real world environments was transformed and *“hardened”* which is necessary when dealing with and preparing for the adversities present within the profession and in practice.

#### 4.2 Case Study #2: Architecture Students

In order to obtain qualitative information from students regarding certain aspects of the learning experience, a qualitative survey was distributed by the teaching team to the bachelor of architecture students who were involved in the South Bank project.

Students were asked whether the use of South Bank as a site for investigation affected their learning in a positive way. The majority of students (85%) agreed that it was a positive learning experience. When examining the student's written responses we can see what the positive learning experience meant to them. Common themes that emerged from the written comments are: context, unique design outcomes, and the impact of real world clients. One student described the diversity of the South Bank context and how it provided opportunities for design exploration.

*"Because of a central urban context. South Bank itself has a broad range of elements from the site context that could be explored and or utilised. The particular site is a very wasted portion of space in one of the cities most centrally public spaces."*

Another student commented on how the site provided a unique opportunity to develop a particular design language.

*"Easily accessible to gather experiential information, the availability of information on the area is high. It provides a unique, but strong character/design language for design outcomes to work with."*

Other students commented on the impact that real world clients provide to the design process. Real clients often come with constraints which have to be addressed by the designer. Often in architectural design courses the briefs that students are provided with are hypothetical. Students indicate that by having real clients with real briefs affects the ways in which students perceive the impact of their design outcome.

*"... its always good to have real world clients and constraints to help you come up with a more practical and functional design."*

As part of their assessment all students involved with the South Bank project were required to undertake a comprehensive research study of the South Bank precinct. Students were encouraged to interact with the local community which consisted of citizens, visitors, workers, and students. There were no students who disagreed on the value of interacting with the local community during site analysis. Students found that by interacting with the community and local stakeholders they were able to gain deeper insight into the needs of the site under investigation and that different people provide different perspectives on critical issues.

*"... all people see things from different perspectives and it is very insightful to speak to others and gain an insight into them. "*

Students were exposed to a range of learning spaces throughout the course of this project. The main face-to-face teaching contact occurred in formal learning environments such as lecture theatres and tutorial class rooms. When students were asked about where their learning occurs the most, the results show that formal learning environments was the most common learning space with 99% of students indicating this is where their learning occurs. Urban environments such as parts of the city was the second most important learning space with 85% of students agreeing that this is an important place to learn. Informal learning environments such as cafés, unstructured meetup or study groups, etc., also appeared to provide space where 67% architectural and urban design students learn. One student commented that although a large portion of learning occurred in formal classes, a trip into the city to visit the actual site of investigation was valuable. The student says that physically inhabiting the urban environment provides a richer experience than what can be shown or represented through images either online or through a lecture.

*“We spent most of the learning time in classes, but a site visit can communicate a lot more in 5 minutes than some photos in a lecture or online.”*

During the survey students were asked whether the city had become a place of learning through the use of South Bank as a site of investigation. 57% of students agreed and 43% of students partially agreed that yes the city was a place of learning. One student commented on how South Bank connects to a much larger network of the city and that it is important to consider how the large transport system operates and affects how the city operates as a grander context.

*“South Bank sits across from the CBD. It is strongly connected through transport and pedestrian/cycle bridges. It is part of the larger context and works as one large system in many respects.”*

From this comment we can see that although it is not made explicit, students are able to see the larger scale of things. Students realise that whatever they introduce to their sites of investigation through their design proposals will have an affect on the rest of the city.

In the survey students were asked if the use of technology and online tools such as social media, blogs, forums, and the use of mobile and ubiquitous technology affected their understanding of the city. The majority of students, with 43% agreeing and 14% partially agreeing, that these tools did influence their experience of urban environments. Students acknowledge that the use of online tools has provided another perspective to the city.

*“... it gives another dimension to what exists.”*

*“By experiencing areas we are already familiar with from a different angle, even something simple like a map or urban scale diagrams can change your perception of a space. It gives differing information to that of ground level.”*

## **5 Discussion**

### **5.1 Case Study #1: Urban Design Students**

The focus of the class with the urban design students was to explore research methods appropriate to the urban design discipline. To teach responsible design approaches it is critical for urban designers to investigate and understand the complex urban contexts and their users for which they design. By shifting the space of learning from the university campus to the city as a place of learning students were faced with the uncontrolled urban environment. The teaching team had to emphasise the importance of the student centred approach, where the teachers guided and advised students however ultimately it was the students themselves who made critical decisions and actively had to engage with their fields of study.

Once students were armed with an understanding of urban informatics and guerrilla research tactics they were released ‘into the wild’ of the South Bank precinct. The urban design students employed a range of traditional and contemporary consultation methods with varied results. Fortunately, they were all able to establish relevant topics for urban design research, acquire and analyse data, leading to a series of conclusions. Although it is difficult to determine the duration and frequency of

consultation times from each team we can still attempt to compare the types of methods employed and establish some basic evaluations.

Based on the number of participants for the different methods that are reported by the students it appears that the analogue engagement method developed by Team A, the Mural Wall, had the highest number of users with 166 unique participants and 332 votes. Although the other teams had portions of analogue methods within their research methods such as paper surveys (Teams B, C, and D) and drawing exercises on paper and the footpath (Team D), the number of users are far from close to what the Mural Wall was able to attract. At this point we can only speculate on the strong success of the Mural Wall, which can be attributed to its ease of use (Green and Red dot voting system) and the fact that its overall design was aesthetically pleasing. The students used hand drawn vignettes as shown in Figure 2 to express the different design ideas for the railway underpass. The vignettes were colourful, creative and fun. As well, the location of investigation has been mentioned through the results from other team's findings to be a truly problematic area in South Bank and one that many users either avoid or recognise as an area in need of improvement. This issue is one in which participants could identify as having tangible outcomes also aligned with Team A's findings that the public are interested in participating in community consultation if they can see that their input will lead to change and results.

All of the teams actively explored and developed online tools and mobile devices to assist in their data acquisition. Although the results did not have as high a number of participants as the mural wall, the information collected provided valuable insights to the students. The urban design students recognised the potential for the use of urban informatics techniques to develop innovative engagement possibilities.

The teams incorporated social media as a means to attract participants to their online surveys or mapping applications. Facebook commonly was found by the teams to be the strongest form of connecting to online participants.

Team B incorporated a photo sharing option to participants through the use of a Facebook Page, Instagram, Tumblr, and Twitter. The team reported that there were only 4 photo shares during their community consultation period. This number is low. However, it does indicate that people did participate and if this option was promoted more and for a longer period of time perhaps there would have been more photo shares from more participants. The fact that one of the images shared in particular was of Exhibition Road in London, submitted as an example of a pedestrian friendly cultural boulevard. The purpose of this contribution is to learn from another city, which is a fundamental aspect of smart city learning.

## **5.2 Case Study 2: Architecture Students**

The 4th year architecture students had a different experience with the site than the urban design students. Firstly, in the architecture class the main objective for students is to design a building, which differs to the main objective of the urban design students involved in this study whose main focus was to learn and conduct research appropriate to urban design, not to design a part of the city. Although the architecture students' final outcome was not a research report, the process of designing a building or any artefact requires research. The architecture students were asked to focus on researching the site of where their building would sit for one of their assessments.

During this research phase students were exposed to traditional site investigation methods and some contemporary digital and online methods. Students were not required to conduct formal community consultation processes however many of them inherently did interact directly with the local community as part of their research. As such the architecture students were not formally exposed to the same types of research methods as the urban design students. Although this was the case the architecture students still agreed that ubiquitous technology, online tools, and social media affects their understanding of the city. This is something which needs to be promoted throughout architectural education as an opportunity to engage with developing technology to improve the design process.

Typical to architecture education is the use of hypothetical projects with hypothetical clients. In this study the 4th year architecture students were exposed to a brief developed by a real client. The opportunity to address the needs and desires of a real client provided a rich learning experience for the students as they faced a scenario much closer to what would occur in actual architectural practice. Students learned directly from the client what the design constraints must be. In order to address these constraints the designs have to be functional and practical therefore improving the design outcome. The results also indicate that the architecture students acknowledge the city as a place for learning.

## **6 Conclusion**

The community consultation process is a critical path taken leading to the understanding of the needs of a community. Although this occurs within the architecture profession in architectural practice it is not formally taught as part of the current architecture curriculum. In the architecture course site analysis is heavily enforced however the trend is to focus on climatic conditions, user statistics and relevant quantitative information. Architecture students should be exposed to the importance and methods of qualitative research and community consultation throughout their course of study. The insights that the local community can provide are critical to good design processes. The focus of architectural design is to create spaces and places for people to use and enjoy. To do this appropriately their needs have to be understood and addressed.

These case studies emphasise a range of methods including digital and online approaches to the community consultation process. By combining urban informatics and guerrilla research tactics with creative skills, design students can approach the consultation process in uncountable ways. Not only do the students learn from the process and outcomes, they enjoy applying their creative skills to new technologies for the purpose of understanding the city and how the urban environments operate at a much deeper level.

The students were not consciously aware of how all of their efforts to interact with the community was contributing to smart city learning. Not only were the students learning and gaining insight from what the community shared with them, the community was also learning and reflecting on the questions that were presented to them by the students. Relevant issues to the success of the identity of South Bank are

raised through the students outcome and design proposals, the community consultation process will inform future design decisions conducted by South bank corp.

Throughout the processes and outcomes described in this paper the teaching team will continue to develop and promote innovative ways to engage with local urban issues and stress the importance of using the local city environment as a place for learning for architecture and urban design students. This project highlights the role of research in the design process and how students can become empowered by the knowledge they create.

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## 7 References

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