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In 2012 a collection of architecture and design schools in Auckland, Wellington and Christchurch came together under the umbrella of FESTA to realise a city of light within central Christchurch, devastated by the events of recent earthquakes. The aim of this project was to re-introduce life back to the city centre and provide the community of Christchurch a central city destination for one night.

The large scale fabrication projects offered to students from 2012-2014, in collaboration with FESTA and other Architecture Schools, required students to realise built projects at a city scale. The learning that goes with taking a project from concept, scale model to mock-ups and full scale fabrication involves constant testing and re-testing of solutions, of failure and advancement. Large scale fabrication projects require students to work in a continually reflective way, responding to a number of variables, including very real ones of budget, site, client and technology.

This paper reflects upon these live build projects and the requirement of students to continually explore design responses and develop their solutions through exploring an iterative design environment of prototypes, impressed upon them through the requirement to test and evaluate design proposals based upon real and theoretical design criteria.

The most important quality in an architectural education would appear to be that of designing, given that this is the area the majority of time is spent. The importance placed on design would suggest that we believe that the act of designing can be taught, that when a student leaves his or her education they will be a better designer than when they entered. The primary means for exploration of design in an architecture programme is the Design Studio.

The traditional process for an architectural Design Studio is for a design brief, or project, to be set to students by the studio master to which students will present a series of responses for individualised critique and subsequent advancement. These proposals are normally (but not always) drawn from a limited study of precedents and adapted for the established conditions and will consist of drawings and physical and digital models. This will often be to establish some level of competency with regards a building typology or architectural idea, the back and forth occurring until such time as the learning objectives are met or, more often, as the project deadline materialises. Design process in this case will be disposed to focus on particular aspects deemed necessary for an architect to understand and forms an important part of one’s architectural education, exposing students to important characteristics of critical thinking, planning, composition, environmental considerations, technology, site, context and the like. Through this process a student becomes aware of things that they are required to understand as an architect but there is little opportunity for them to extend the exploration beyond the aims set out by the brief. Students are, as Donald Schön puts it, problem solving rather than problem setting and as such, have little opportunity to understand the process of designing.

"From the perspective of Technical Rationality, professional practice is a process of problem solving. Problems of choice or decision are solved through the selection, from available means, of the one best suited to established ends. But with this emphasis on problem solving, we ignore problem setting, the process by which we define the decision to be made, the ends to be achieved, the mains which may be chosen. In real-world practice, problems do not present themselves to the practitioner as givens. They must be constructed from the materials of problematic
situations which are puzzling, troubling and uncertain.”

Design Studio forms the heart of architectural education and “emulation” is a key part of the learning. It is curious that architectural studio teaching in its usual form tends to limit students to seek and apply solutions to a known problem of an architectural typology. We know that students will tend to produce the obvious and this will reduce their capacity to understand at a meaningful level what is being asked from them.

Ruth Morrow discusses the relationship between Design Studio projects and Live Projects and that Live Projects may be set up to serve a different role from Design Studio projects. While we agree that Live Projects introduce students to a range of alternative skills, particularly around collaborative agency, it is the relationship between the two in terms of the process of iterative designing that the following case studies seek to explore.

FESTA LARGE SCALE FABRICATION STUDIOS.

The large scale fabrication studios undertaken as part of the Festival of Transitional Architecture (FESTA) presented an abstract problem to students to solve, namely to realise temporary architectural projects at a city scale for public consumption for a single night. The students were drawn from architecture and design departments at the University of Auckland (SoAP), Christchurch Polytechnic (CPIT), Auckland University of Technology (AUT), Victoria University of Wellington (VUW) and Unitec.

In each of the programmes (2012, 2013 and 2014) the installations required interaction with the public as well as engagement with a local client. In every case projects started out with a zero dollar budget. Many ‘firsts’ occur in this project; the first time students are required to work collaboratively, the first time students present or market themselves externally, the first time students negotiate council regulations, the first time students engage with a client, the first time students realise a project at full scale.

These ‘firsts’ are of course generalisations but serve to contextualise where the project sits within a student’s education and the multitude of new challenges that are faced with such a task. They also highlight were the normative studio experience, which focusses on the individual, might exclude exposure to a number of necessary skills required by students for their professional careers. Additionally, in having very little precedent for the outcome there is an emphasis placed on discovery, on the iterative nature of the design process as new challenges are faced and solutions pursued.

The focus will be on the programme offered in 2012, the first iteration of the projects with FESTA. As the FESTA event evolved over three years so too did the framework within which the projects sit, largely driven by stricter council controls. These first projects then offer greater diversity to choose from
when analysing the student approach.

Small teams of students, 4-6 in number, initially presented preliminary research and exploration to a jury panel. Students were encouraged from the outset to make things and explore the physical properties of light and materials. This led to a number of highly inventive ideas at a conceptual level with great capacity to be scaled up to a city sized realisable structure.

Through working with a variety of media and scales students are able to better understand the full consequences of their design decisions. What begins as a small jelly cube with a light inside (and perhaps questionable architectural value) might come to be an entire interactive field of light for people to walk through.

The projects undertaken in Christchurch required economy of means. The projects had to be transported from Auckland to Christchurch (ideally within the standard airline luggage limits), be erected within a day for a single night event and then removed without trace of waste at the end of the night. This moved students into the direction to explore the qualities of light and lightness, both the medium of light and materials with physical light-weight characteristics.

The following case studies examine some of these issues.

**SILHOUETTE CARNIVAL**

The initial concept for this project was established by a group of Chinese International students based on their understanding of traditional Chinese Shadow Theatre. The project used the notion of projection of a light source onto a body so that the silhouette could be viewed on a translucent surface. This meant that the origin of the light could be small but had the challenge to construct a suitable surface onto which the silhouette could be viewed.

The initial group were combined with a group of students whose original project sought to create free-standing objects from construction materials, to build on the concept of the Terrain Vague. The two teams were merged due to complimentary skills...
and also as each project offered possibilities for exploration to the other.

With the lighting aspect of the project generally understood, the combined team set to explore methods for constructing free-standing projection screens. This necessitated engaging with issues of construction at an early stage to test how materials would react in an external environment. The initial layout for a concentric arrangement of planar elements began to give way to more three-dimensional shell type structures that an ‘actor’ could inhabit. This began to work with the associated client for the project, the Free Theatre Christchurch who began to programme activities that would engage with the built structure. New challenges were added by where structures could be picked up and moved yet still remain free-standing when not in use by the actors.

Another layer of detailed design exploration was therefore required to examine how the structure would connect to the ground. The project site shifted from sealed to unsealed surfaces several times as negotiations regarding the overall project boundaries ensued. A solution that could meet either condition was required.

As the design developed the footing connection began to inform how the overall shell structure could be formed, with curved members springing from a single point. With a basic shape becoming finalised, further criteria for the material investigations for the shell covering were established. The group established the parameters by which the material needed to perform; the ability to receive and transmit a shadow, the ability to warp and twist to a form, the ability to absorb and allow wind to pass through and the ability to give some element of rain protection. Experiments again were undertaken initially at a scale model level and then at half and full scale realisations.

Throughout the process students realised the need to gain new skills for construction as well as learning how materials and means of fabrication will affect design decisions. Some learned to sew while others to weld and all of them to tie knots! The success of this project could be measured at many levels; the integration of two design concepts and cultural
backgrounds provided a fertile environment for growth and learning from one-another; the ability for the design to respond to a variety of physical conditions including a last minute change of site; and the ability for the project to remain successful at a social level by enabling public engagement when in the final moments it became apparent that the client wouldn’t be able to partake in the event.

Reflecting on the work carried out by this group of students we clearly see them setting themselves problems to be resolved, a critical aspect of learning to understand the design process. Alongside this the number and variety of solutions presented emphasise how iterating enabled the students to solve the problems they set themselves in their realisation of a large scale architectural installation.

ARCHROBATS
The team Archrobatics started life as Spherical Sounds, a scheme utilising glowing spheres to illustrate the call of a Tui, a native New Zealand bird. The intent was to create a structure suspended overhead, establishing an environment below for the public to engage with. This project underwent the most radical of formal transformations of all the groups and finally resulted in an extremely elegant structure.
In working through variations of their initial design proposal the idea that appeared achievable at a small scale was becoming unwieldy at full size. In setting about resolving the design challenges presented by the initial scheme students concluded that it was proving too expensive and unreliable to construct, not to mention posing physical danger, and the group came to the conclusion that a change in direction was necessary. With a focus on achievability and simplicity the group looked at a single point of vertical suspension from what would be a crane hook, 30 plus meters above the ground. The pyramid type structure that was emerging was used to suspend the spheres from the initial concept within. At this time a rigid structure with steel cables was imagined with the spheres being the light emitting object. As continued exploration into materials, including the spheres and alternatives were undertaken, a decision to omit the spheres altogether and focus on the shapes that could be formed by the structure itself was made. As considerations regarding site and flexibility were also included greater levels of flexibility were considered and explored for the overall structure eventually resulting in rope forming the guiding members. In testing materials criteria were established by the group where wind loading would be the dominant factor given the height of the structure, along with lightness, the ability to accept light cast upon it from LED light sources and the ability to flex and hold a shape under tension. The group eventually settled upon agricultural bird netting.

Grounding the structure was another design challenge, met mostly through the use of deadman weights but also through the filling of empty sacks filled with rubble from the site itself. Through testing of the construction technique using rope, netting and lights and a variety of scales and settings the group were confident that they could quickly erect and adjust their full scale scheme onsite. The particular success of this project lay in students’ ability to identify there being an issue with the initial design proposal. What might be considered a failure provided the basis for the group to better understand their constraints, establish priorities and reset their design problem, demonstrating their learning from earlier setbacks. Learning from failure is an important aspect of design and failure can be considered a success if students are able to demonstrate learning from it. Failure additionally highlights to students that design solutions can change for any number of reasons, again encouraging them to iterate in their design thinking. In being able to re-establish the design problem, goals and objectives, the group was able to achieve one of the most successful outcomes of the evening. All material was transported on the aeroplane, the project was erected in a short period...
Peter McPherson, Archrobatics, LuxCity, 2012.
of time with site specific adjustments to the overall shape incorporated and de-installation of the project took moments with zero waste left behind, save for what was already found onsite initially. The project itself had an ephemeral quality to it during the daytime and as day turned to night the beauty of the three hyperbolic forms came to life on a city scale.

CONCLUSION
Design is an iterative process. Much learning is achieved by failing. James Dyson states it took 5,127 prototypes and 15 years to get his famous vacuum cleaner right. He compares this to Edison who said, "I have not failed. I've just found 10,000 ways that won't work." 10, 000 failures that resulted in 1093 patents. With each failure, the problem is better understood.

The two case studies presented here highlight two key components of the design process; iteration and failure. In exposing students to these types of projects failure becomes a core part of the learning. In confronting failures the reasons to alter a design, to iterate, become more varied and tangible to students. In better understanding the reasons for altering a design alongside the setting of their own design problem, students become more engaged and aware of their thinking and process. This is in contrast to the traditional student and mentor Design Studio relationship where design is guided and the student can remain removed from the process of understanding the problem.

A key component to establish this understanding is the production of the architectural object. This is in contradiction to James Benedict Brown’s findings whereby less than 10% of respondents in his research10 considered construction to be an essential component of the Live Project. In engaging with the making of something, students are moved outside of the teacher-student learning relationship and the realisation of the architectural object becomes linked to the design process itself, the distinction between design and process is blurred11 and the two become linked in the students mind.

Through an open brief with the emphasis placed on students to set their own design problem a process of iterative exploration becomes the only way in which a successful outcome can be achieved. These projects equip students with an understanding of not only how to solve problems but also how to set them. And that in order to achieve a positive outcome, the design, and the design problem, is required to be interrogated over and over, through failure to success.

10 James Benedict Brown, A Critique of the Live Project, PhD Thesis, Queen’s University Belfast.