This paper explores the engagement of architectural students with music in a second year design studio, through a Game and two design projects. A 'Game', in the context of this research, is a low-risk learning activity derived from the model established in the CUTSD 'Reflective Making' project. The Game required students to complete one of three tasks; to compose and record a piece of electronic music; to research the works of a composer within a digital presentation or to design a prototype musical instrument. This was used as a generative device to inform the design of a Music Room: a space for the contemplation and composition of music. A third stage of the project involved the actual construction of 8 Music Rooms, a high-risk, high-reward activity that requires physical resolution of an established relationship between music and architecture. This paper will focus on the engagement of architecture students with the Game and related design projects. Student perceptions of the project are used to inform an evaluation of the project as an authentic learning experience and as a valuable component of their architectural education.
CONNECTIONS BETWEEN MUSIC AND ARCHITECTURE: INFLUENTIAL ANTECEDENTS

The context of this research is an educational environment that reduces the scope of a broad-based architectural education. This is brought about by pressures on curriculum (such as the reduction to nil in this School of non-architectural electives) and HECS which has encouraged a student cohort that is ill-informed of the cultural context of architecture. It is contended that valuable opportunities exist within the design studio to encourage students to look outside of architecture for inspiration for architectural design. The subject of this paper is one design curriculum that examines relationships between music and architecture through a staged progression from conception to construction.

The curriculum under discussion was influenced by a number of projects integrating music and architecture. This paper does not attempt to offer a comprehensive overview of connections (see McGilvray 1992), but discusses ideas that directly influenced this curriculum. Vitruvius serves as a good starting point for discussions, as his scholarly work is still referred to for his view of architecture as 'one of the most universal and inclusive of human abilities'. [1] Music has been defined since antiquity as a mathematical science within the quadrivium of astronomy, music, mathematics and geometry. Architecture was regarded as a mechanical art, until its 15th Century transformation into a liberal art through the firm theoretical foundation of mathematics. [2]

Martin (2000) has established a construct for the examination of music and architecture on three levels: ‘Based on acoustics’ (eg Bernard Leitner's Le Cylindre Sonore), ‘Instrument as Architecture’ (eg Ellen Fullman’s Long Stringed Instrument) and Layered relationships (eg Steven Holl’s Stretto House). Martin also describes the
'y-condition' as 'the middle position of music + architecture when translating one to the other and finds an ‘organic union (p16)’ between the two. Literal translations of music into architecture have been explored recently by Ferschin, Lehner, and Oka (2001) through the real-time translation of midi files into 3D CAD ‘architecture’. 

A truly inspiring exemplar of an innovative ways of generating form from music in real time exists in the collaborative efforts of the Aegis Hyposurface team. This team (with members based at Deakin Architecture and Building until 2001) developed an ‘interactive dynamically reconfigurable surface that would respond to stimuli (including music) from the environment in real time’. This project proved that the examination of relationships between music and architecture can result in exceptional outcomes. This project also proved that, if one is to move into actual construction, considerable creative, intellectual and organisational effort is required.

**INTEGRATING MUSIC INTO THE ARCHITECTURE CURRICULUM**

The Deakin University and University of Adelaide Committee for University Teaching and Staff Development (CUTSD) funded ‘Reflective Making’ project created a dynamic research environment within which to develop architectural curriculum. ‘Games’ were incorporated into the project as low-risk learning activities that incorporated play and fun within a digital environment. Games were trialled at Deakin within the Construction and Structures 2 curriculum in semester 1, 2001, but proved to not to be particularly playful. Following this experience, two games were incorporated into the semester 2 design unit (Architecture 2b) that were designed to embody a true sense of play.

Games were used as a pedagogical device to accompany design projects: to facilitate ideation and to help generate a dynamic, creative studio environment. This paper will discuss one Game (Composition and Instrumentation) in relation to two staged design projects (Composing Architecture and Composing Architecture@1:1) and research undertaken in 2001, 2002 and 2003.

The ‘Composition and Instrumentation’ Game was designed to test two contentions: that ‘practitioners of music and architecture share similarities in compositional and design processes’ and that ‘musical instrumentation and architectonics are both products of making, reliant on intuitive and sensory interplay in order to produce a finely ‘tuned’ artifact’. The Game provided opportunities for students to ‘cross the floor’ and explore areas outside of architecture within the design studio. The Composition and Instrumentation Game required students to undertake one of three tasks: to compose a musical piece using music shareware, to research the
works of a musical composer and prepare a digital presentation or to design a prototype musical instrument. The Game required an initial presentation of ideas in the first week, followed by a final presentation with the accompanying design project.

This project, ‘Composing Architecture,’ operated over a five week period and comprised 30% of the unit marks (including the Game). The Composing Architecture project required the detailed design of a space for the contemplation and composition of music: a Music Room. Explicit links were required to be made within the Music Room to the Composition and Instrumentation Game. The project adapted the pedagogical intentions of Professor Mark Burry’s ‘Reading Room’. [9] Although the project is framed within a theoretical exploration of connections between music and architecture, this operated as a ‘lure’ to draw students into the primary learning aims: developing understandings of the relationship between tectonics and architectural design.

The next stage of the curriculum extended the examination of music, architecture and tectonics beyond representation and into real-scale modelling. From the 89 ‘Composing Architecture’ submissions, 8 were selected for actual construction in teams of 12 students within a period of 3 weeks. The integrity of music: architecture relationships were tested in real-scale, in real-time. From the playful beginnings, the Game and design projects elevated the risk progressively, completing the process with the high-risk, high-reward task of actual construction.

STUDENT INVOLVEMENT IN THE GAME AND PROJECTS

Students were required to select an option for the Game (see above) and were challenged by staff to operate beyond their comfort zone. Students selected projects based on either deep or shallow approaches to the task: One student selected an option because (he) couldn’t do the other two,’ whereas a second student designed a musical instrument, because it is a ‘much more dynamic adventure when taken out of your comfort zone.’ There was some evidence of a trend towards students selecting the option of researching a composer as the easiest option. Creative design students generally selected the option of composing the musical piece.

Architecture students’ musical compositions were of a high quality, in consideration of the limitations imposed by students’ knowledge of software and digital recording. Quality was determined largely by effort, creativity and access to computers, recording devices and software. Given the software, skill and time limitations, the quality of compositions was exceptionally high. Although perceived to be at an advantage, students with prior musical training were often surpassed by students with
no previous experience. This was, in a number of cases, because trained students reverted to what they already knew whereas for others musical composition was a new, exciting challenge.

Compositions comprised three general types: ‘musique concrete’ (electronic music composed of instrumental and natural sounds often altered or distorted in the recording process), acoustics solo pieces (generally on piano or guitar) or techno/dance music largely influenced by shareware music programmes (see figure 2 left).

Interesting outcomes for the Game included one student who constructed a ‘guitar’ from a turtle shell (properly tuned), tuned Aeolian chimes, and instruments from found objects such as spanners (see figure 2 right). Students also undertook research on the works of a diverse range of composers, including Mozart, Frank Zappa, John Cage and John Coltrane.

From operating within a playful environment, students then designed the Music Room in a way that related to the Game. Levels of integration of the ‘Composition and Instrumentation’ Game into the ‘Composing Architecture’ project varied from deep to shallow responses. Establishing connections was generally perceived as a hard task for second year architects, particularly when the brief called for a high level of detailed design. It would be interesting to operate this project in higher year levels to compare outcomes.

The level of integration was, perhaps, indicative of the depth to which each student approached the design. Whilst one student used ‘ideas of time, meter, proportion, emotion and mood’, another thought that ‘the sound of the instrument was integral to (his/her) concept of the Music Room.’ Only two respondents to the survey offered comments suggesting that they didn’t integrate the Game with the design. One
student thought that the Game ‘was an influence but not a great correlation’ and another stated that s/he ‘still (doesn’t) really understand the music power. It doesn’t help much.’

One project, by Tueta Jerleu, embodied connections between music, architectural concept and (eventually) constructed artifact. Tueta (a student with some previous piano training) presented to the studio a piano piece that she had composed in memory of a friend who recently died. The emotion inherent in this piece of music was truly moving. Tueta then related an architectural concept to her composition and the memory of her friend. The idea of a ‘room’ for the contemplation and composition of music was challenged. Tueta designed a fluid fabric installation that worked within the void of the main stairs at the Deakin Waterfront campus. The fabric artefact, embellished with words evocative of the designer’s friend, re-defined the everyday experience of travel up and down the stair (see figure 3). Classical music, floating up the void, enhanced the experience.

Fig. 3. Teuta Jerleu’s presentation for the Composing Architecture project

Teuta’s project was one of eight designs constructed at 1:1 scale on site within a space of 3 weeks by a team of 12 students (see figure 4). The constructed outcome matched the design concept almost exactly - complete with lighting and classical music. For students who worked on the construction, the results were described as ‘wicked.’ This project, from the initial Game, to the conceptual design project and through to ultimate resolution through real-scale modelling, exemplified the intentions of the project. Other projects achieved a similarly high quality of constructed resolution (see figure 5). The students were given credit for their hard work, dedication to construct (and obtain sponsorship for) complex schemes within the time period of three weeks. Teams achieved a Distinction average in consideration of the difficulty of the project.
PERCEPTIONS OF THE GAME AND PROJECT

Perceptions of the project were provided initially by the comments provided to studio staff and an end-of-semester unit feedback survey. Follow-up evaluation was undertaken five months after the completion of the project to gauge long-term impressions of the project for purposes of this paper. This evaluation was in the form of a short paper-based survey with 3 Likert-scale and 5 text-based questions.

31 students responded to the survey. Although this response rate does not allow conclusions that are generalisable to the wider cohort, it is indicative of the authentic perceptions of respondents. The research was undertaken as part of a wider ethnographic study of the cohort. This ethnographic approach is based on the use of multiple and diverse forms of data and engagement with the culture and the acknowledgement of the value of multiple perspectives [11]. The several thousands of words provided by respondents provided qualitative illumination of the issues raised in the quantitative data.
16 respondents composed the musical piece, whilst 11 respondents researched a composer and 4 students designed the prototype instrument for the Game. Respondents’ engagement in and perceptions of the project were generally very positive, based on the indicative survey data. 61.3% of respondents agreed or strongly agreed that ‘games are an effective way to learn about aspects of design,’ whereas 3.2% (1 person) disagreed. 71% of respondents thought that the Game was of value to them for the Architecture 2b unit, whilst only 6.5% (2 students) disagreed with the proposition. 71.4% of respondents felt that the Game was important to their design of the Music Room, whereas 7.1% (2 students) strongly disagreed.

This quantitative data, although useful in gauging general perceptions, is illuminated through comments made by students in the questionnaire. Whilst positive comments were prevalent (eg ‘love music, love architecture and enjoyed the exercise’, ‘keep this in the syllabus’ and ‘it was an interesting and in some cases relaxing exercise’), there were very few negative comments. One student, who provided disagree and strongly disagree responses to the survey, selected the option of researching a composer ‘because I didn’t know anything about instruments.’ This student felt that the Game imposed a ‘huge workload’ and ‘was only relevant if you have a strong interest in music.’ This student's opinion, however, is atypical of the (sometimes strong) sentiment of opinions of respondents.

The Game was considered to be of value for students in many ways. For one student, the Game ‘made one think of architecture in a new way’ and ‘reinforced his commitment to investigate the other arts.’ Another student, who designed and built a musical instrument, felt that this ‘was a good challenge’ and put her ‘in someone else’s zone and think through their perception.’ For another student, the Game and project fostered the view that it ‘will take much time and practice to slowly unravel each process, element and theory.’

Each individual project in the design curriculum is a small part of the learning journey, designed to build a repertoire of knowledge that will be useful in a practice situation. This project has offered valuable opportunities for students to work creatively in non-architectural disciplines, relate this creative output to a design context, then achieve the ultimate resolution of a concept through actual construction. The engagement of students within these activities appears to have made a lasting impact on students who have completed the unit in 2001 and 2002 and has been cited as ‘by far the most interesting project’ for their course.
CUTSD learning evaluator Dr. Di Challis tested the programme against Martin-Kneip’s attributes of authenticity (real purpose and audience, integration of content and skills, disciplined enquiry and academic rigour, explicit standards and scoring criteria, elaborate communication, levels of thinking, reflection and feedback). Dr. Challis’s conclusion was that ‘from the outset, students were challenged and what they produced throughout these intensive five weeks offers abundant evidence that all...were engaged in a rich learning experience...This complex series of tasks demonstrably meets accepted characterizations of an authentic learning experience.’

CONCLUSION

It is clear, through the survey responses, the quality of the students’ work for the Game and associated design project and research by external learning evaluators and the university, that this integration of the Game with the design projects offers authentic learning opportunities for architecture students.

The Game has, for most, provided a fun opportunity to engage in associations with the creative arts within a low-risk environment. The quality of student work offers confirmation that creative skills can translate between music and architecture. The integration of music into architectural design processes can eventuate in tangible constructed form, even within the confines of early year design studios. Architects can become composers.


