Exploring architectural discourse and form through game-like on-line learning strategies

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Abstract

Keywords: design-learning, game/design analogy, discourse, disposition, on-line discussion-boards, VRML.

This paper describes and interprets the use of game-like on-line learning strategies in an introductory course on the theories and histories of 20th Century Architecture and Landscape. Analogies between games and design have been observed by both design theorists and educators (Hubbard, 1980; Woodbury, 2001). The game/design analogy is a particularly useful conceptual framework for design learning, we argue here, because of its robustness as both a theory of design-thinking, and a heuristic representation through which design discourse and practice may be subjected to playful yet critical scrutiny. Game-like learning strategies described in this paper enabled students to develop a critical 'feel for the games' (Bourdieu, 1990) inherent in the form-making and theoretical discourses of recent architectural history. We discuss the game-like dynamics and objectives of two interrelated on-line components of the course's assessment scheme. We make some preliminary observations on student experience with these exercises. We also reflect on relevant sub-issues in the discursive dynamics of on-line design learning, with particular regard to the use of on-line discussion-boards and VRML as a modelling medium portable across the internet that can enable the exploration of spatial and narrative aspects of design discourse in real time.

Introduction

Play has long been recognised as a key mode of learning and, hence, the felicity of games as a means to structure and interpret play in specific learning contexts (Dewey, 1957; Glazier, 1970, Fudenberg, 1998). Analogies between game playing and designing have also been explored previously (Taylor and Walford, 1972; Green, 1977; Hubbard, 1980; Lawson, 1997, pp. 263-268), not least in the context of design learning (Woodbury et al, 2001a). But recent sociological interest in the game-like characteristics of thinking and agency (Bourdieu, 1991) suggests further salient aspects of design, that is as cultural practice, that may be effectively explored in architectural education through the analogy of games. This paper describes and interprets preliminary results in the use of game-like on-line learning strategies in an introductory course on the histories and theories of 20th Century Architecture and Landscape. Employed in an open and polyvalent manner, the game/design analogy can be a particularly useful framework, we suggest, for the critical exploration of design practices in the context of the discourses and cultural practices that frame them.

A pretext for this approach was a theoretical proposition that designers of buildings or landscapes do not so much 'construct' spaces as they delimit and circumscribe these in a game-like manner - in terms of both physical and conceptual constraints - from the infinite space of potential design solutions. It is within this 'game space' as it were, of practically limited and thereby definable and accountable possibilities, framed by mutually recognised (if not necessarily explicitly stated) rules, that distinguishable patterns, modes or styles of designing tend to emerge. In the specific context of a course that aims to instil a critical understanding of the theoretical and historical backgrounds to contemporary design ideas and practices, the game/design analogy brings into question some of the more pervasive assumptions about the 'progressive' development of architectural thought in the modern era, and its formal expression.
In the following sections we proceed, first, to further develop our operative definitions and premises with regard to the game/design analogy and its pedagogical applicability in the critical exploration of contemporary architectural form-making and theory. We then give a general overview of the aims, objectives and structure of the specific course curriculum in question. In two further sections we explain the game-like aspects of two interrelated on-line components of the course’s assessment scheme. We then observe student experience and performance in the digital ‘game-spaces’ of those exercises. Finally we discuss and interpret these observations with regard to three theoretical aspects of game-playing - cultural capital, disposition, and play - that have particular relevance, in our view, to the critical interpretation of recent architectural form-making and theory, not least the rapidly evolving discourses of design in the digital age. In our observations and discussions we also reflect on relevant sub-issues in digitally-supported design learning, with particular regard to the use of VRML for web-based three-dimensional composition.

A NOTE ON ILLUSTRATIONS: Due to privacy protocols and proprietary restrictions governing access to the on-line learning media described in this article, it has only been possible to provide offline illustrations of a small selection of content. All student work is illustrated here with the consent of the individual authors.

Games and Play in Design Learning

How is design game-like?

To answer this question, we need to define what we mean by "game". In everyday speech the term is used literally with reference, for example, to sport: "let's play a game of tennis". The game in this sense is simply the course or period of such an activity. But the term is also used just as readily as an analogy: "what is your game?" that is, your field of gainful activity or area of expertise. "Design!" could reasonably be an architect's reply to such a query. The game in this sense could be defined in reductive utilitarian terms as "a procedure or strategy for gaining an end" (Merriam-Webster OnLine). More commonly, however, games are regarded as anything but the productive business of real work; rather, as a diversion - a form of recreation or amusement. But games achieve such diversion by establishing a form of artificial situation that usually (though not necessarily) involves the player in some form of contest or rivalry, strategy, or even struggle (Encyclopaedia Britannica on-line). As organised sport or even the spontaneous games of children indicate, games in this sense can be remarkably serious and rigorous in their internal coherence and focus of play even though they have no external "end" or objective other than pleasure (Hubbard, 1980, pp. 51-66).

It is these aspects of voluntary rigour and conviction arising from a player's willing complicity in the invented world of the game and its conventions that we regard as particularly compelling parallels to design thinking. Indeed, as the design methods theorist, Chris Jones, appositely defined it, design is "the performing of a very complicated act of faith" (Lawson 1997, p.165). Although architects are rarely as comfortable as other designers may be with the notion of simply working within a "style", as Lawson has observed (Lawson 1997, pp.161-167), they tend nevertheless to underpin their design thinking and action according to some form of rule system or elective constraints. These are what are typically referred to as a particular architect's design philosophy or principles. While, technically, the possibilities open to a designer may be relatively limitless it is these rule-like principles that give an architect the conviction to make certain decisions and to sustain a certain style of decision-making through which complex designs may be carried out. Designing could therefore be said to be game-like in at least two ways: (1) as a form of exploratory play within and upon the rule-like bounds of convictions and conventions about the supposed object or end-product of such designing (eg. "house", "hospital", "mosque", etc.); and (2) as a further sub-set of rule-like tendencies that we might call a "style of play" or, to refer back to one of our earlier definitions for 'game', a "procedure or strategy for gaining [that] end" - that is, a distinctive and identifiable style of design.
But how is this game/design analogy useful in the design learning context?

The short answer is that games are one way of representing the somewhat mystified object of study, "design", in a more intuitively obvious form amenable to student-centred learning. As we have begun to discern above, the game/design analogy is polyvalent in nature with multiple possible implications for our theoretical understanding of design thinking. But the most immediate value of this analogy in the design learning process is the heuristic function that 'design-games' can serve in representing design as a form of knowledge that is actually learnable in the first place. As Woodbury et al (2001a) observe in a critical assessment of their own experience in using play-based approaches to design learning over a number of years, lack of initial skills and, hence, confidence in form-making can be a debilitating handicap to the early design student. This often leads to frustration and disillusionment as the initially less skilful students soon become distinguished as seemingly less "creative" or "imaginative" by contrast to those ostensibly gifted with an innate talent for design.

Representing design problems in the form of design games, they find, creates a more objective and neutral solution space in which the early design student is enabled to explore the design problem without potentially debilitating introspection. Play is intrinsically engaging, reassuringly bounded yet free. Play enables one to take risks and extend their self in the knowledge that it is "just a game", breeding confidence and building new skills. Moreover, play is open-ended. In organised sports and other such competitive games the more a player plays the more they can improve and, in a sense, "change their game." Of course there are other types of play as well. Caillois (1962) discerns at least four types - competitive, chance-based, simulating, vertiginous - from which many different forms of game may derive. In non-competitive play such as "exploration", or in role-playing games as another key example, the boundaries and rules may be quite fluid, evolving as the game goes along. The dialogical nature of such open-ended play is one of the more significant parallels between game playing and design thinking - according to Schon's paradigmatic notion of designing as "reflection-in-action" (Schon, 1983) - that we believe can be emulated usefully in design learning scenarios.

Much of the existing research and experience with playful approaches to design learning has been focussed on form-making skill development in the context of the design studio, in both conventional (physical) and CAD media (Woodbury et al, 2001b). But we believe that the game/design analogy can also be applied with similar critical and pedagogical value to the "games" that designers and their interpreters play in the "field", as it were, of design discourse - that is the historiography and critical discourses of the respective design disciplines. The game-like components of the course on 20th century architectural history and theory that we describe in later sections of this article were developed in the context of a broader collaborative exploration of playful approaches to design learning involving a range of different courses across an undergraduate 'design studies' curriculum. Building on the groundwork and pilot studies of the principal investigators (Woodbury et al 2001a, 2001b), the main concern of this on-going collective investigation has been to understand how play and designing relate and, instrumentally, to conceive games that are useful in learning about designing. The notion of "games" is intentionally under defined for the purpose of this research as, simply, "play scenarios". This enables the game/design analogy to be explored in an open-ended interpretive manner, as a hermeneutical metaphor rather than a subsuming simile; that is, as a relation that simultaneously informs both things being related (Woodbury et al, 2001b).

Explored in this metaphorical manner, the game/design analogy can be a particularly useful learning tool, in our view, to address the heterogeneous and conflicting nature of architectural thinking and practice over the past century. The key in this regard is the robustness of the analogy as both an arguable theory of design-thinking, and as a heuristic framework through which design may be subjected to playful yet critical scrutiny. To ask students to critically test the theoretical proposition, for instance, that Modern Architecture was 'just a game' puts not only the formalisms, but the putative instrumentality of modernist thinking into critical perspective (Hubbard, 1980). On the other hand, game-like on-line 'e-tasks' and projects set for this course by-passed some of the pitfalls of the conventional major essay as a learning and assessment exercise for a course concerned not only with conceptual knowledge about the ideas and historical developments that shaped the architectural forms of the 20th century, but with a form of practical knowledge invested in the actual making of such form as well.
These exercises enabled students to develop what the sociologist, Pierre Bourdieu (1990), called "a feel for the game." As Bourdieu argued in his extensive writings on the logic of practice, the "rules" of behaviour are usually unstated in cultural practice. They remain implicit in a complex and dynamic interdependency between the intentional actions of individual participants and their socially structured situation (Bourdieu, 1977). Artful players are those who develop a particularly sure and agile 'feel for the game', as it were; whose own distinctive performances within these implicit and dialogically evolving constraints tend to emerge as the defining models or examples of the cultural practices in question.

As we discuss in subsequent sections of this article, a combination of playful scenarios comprising major components of the assessment for this course compelled students to undertake digitally mediated explorations - both experientially immersing and critically discursive in nature - in the spatial and conceptual game-spaces (or space-of-play as it were) between the contending forms and ideas of influential players in the architectural field, past and present. This drew critical attention to the equally significant role of implicit rules and dispositions in the discursive development of design thought in practice.

Course Aims and Structure

20th Century Architecture and Landscapes is a second year core course in the undergraduate Bachelor of Design Studies degree program at The University of Adelaide. It is concerned with changing forms, and 'forms of thinking', in the environmental design disciplines since the 19th century. Its first aim is to place these various ideas and forms, and theories about them, in a coherent historical framework. Through such a framework we attempt to discern some of the temporal, spatial, critical and cultural relationships between these forms and ideas that might enhance student understanding of them. Furthermore, the course aims to help the individual student to begin positioning herself or himself, critically and empathetically, within this framework with regard to the past and present design discourses they find inspiring.

The course also aims to further develop skills in articulating issues, themes and strategies of environmental design that students begin to work with in their first year subjects. In particular, it builds on Image/Text/Architecture, the preceding core course in design History and Theory. But whilst that course is concerned with the role of 2D text and graphic design in the representation and historical transmission of architectural thought, 20th Century Architecture and Landscapes introduces students to issues of 3D spatial composition. By drawing on the formal and theoretical resources of 20th-century architecture, landscape architecture, and urban design it seeks also to enhance appreciation of the possibilities of critically appropriating published writings and projects to enrich and focus students' design perception and communication skills.

The lecture series is structured chronologically in two distinct parts. Part 1 [Weeks 1-6] is concerned with formative ideals of 'Modernity' in the environmental design professions (including engineering) that arose in Western Europe between the 16th and the 19th centuries and how these finally crystallised in the first half of the twentieth century and played a role in the major social changes and crises of that era. These initial lectures also introduce four different theoretical frames of analysis (Models, Technologies, Methods, Ideologies) through which this design history can be interpreted. Part 2 [Weeks 7-12] considers critical and theoretical issues in design arising from major historical and related conceptual changes in the increasingly 'global' and self-consciously 'post-modern' civilisation of the second half of the 20th century. These later lectures also attempt to help students address the larger themes of 20th-century design thought and practice in their own work. In designing one way rather than another, we suggest, a designer marks a disposition towards a range of issues, each with its own history. Notions of grids, of complexity, of structure as ornament, of construction as design are some of the conspicuous formal tendencies of recent environmental design. The final lectures attempt to indicate possibilities for reading current architecture and landscape architecture in terms of the larger themes of modern history, and in relation to one's immediate concerns as a designer.
The lecture series is also structured in two parallel streams. The first of each weekly pair of lectures posits a 'top-down' point of view, exploring the topic through theoretical descriptions and issues. The second lecture continues the alternate stream, working 'bottom-up' to interpret specific case histories and empirical examples. While this format enables the illustration and elaboration of points and arguments of the theories discussed, it is also intended to enable students to recognise the inevitable partiality and incompleteness of such theoretical descriptions—compelling as these may be—with regard to actual historical phenomena.

Weekly tutorial sessions provide a 'real-time' forum to develop and probe the students' understanding of the broad issues of the course, and to help them bridge conceptually between the structured content of the lectures and each student's own self-directed study towards the major assignments. These sessions are structured around a series of short exercises in 3-dimensional composition and analysis, critiques and topical debates.

Assessment is continuous throughout the course, involving critical dialogue and incremental minor submissions leading up to a major assignment. Each of these discrete tasks is directly performed or published through the medium of an electronic bulletin board (hereafter, eBB), the backbone of the student-centred learning strategy of the course. The major assignment (Project 2) requires students to explore the ideas and forms of 20th century architects or landscape architects of their choosing in what we describe as a four-dimensional composition, that is an on-line text together with an on-line (3-D) spatial composition that articulate each other in close juxtaposition.

The game-like dynamics and pedagogical objectives of this on-line approach to learning and assessment are analysed in the remaining sections of this article.

**Self-directed Learning in the Discursive 'Game-Space' of the eBB**

In this section we examine the game-like dynamics and objectives of the electronic Bulletin Board, or eBB, the on-line backbone of the student-centred learning and assessment strategy for this course.

The eBB is an on-line forum in which an incremental series of assessable submissions, or 'e-Tasks', compels students to articulate their views and to cross-examine those of their peers; to make links to pertinent published references and other resources, and to publish additional material to support their arguments. Technically, the eBB is an on-line discussion board and virtual gallery that operates within a much larger on-line learning support and management system developed for use across the university and, hence, a broad range of different curricula. The eBB therefore departs from and evolves within the default features of a generic template, as an interactive web-site that enables students to publish text, images, 3D models and animations, sound clips, and hyper-links to other pages and sites including the submissions of other students. At the same time it tracks the time and discursive context of all submissions, and archives these for later review. All users can display and cross-index the progressively expanding content of the eBB in a variety of modes (theme, author, date) to facilitate search and analysis.

As a pedagogical tool, the eBB serves the primary aim of the course to enable the student to begin positioning herself or himself, critically and empathetically, within the theoretical and historical frameworks of recent design thinking and practice. While the formal lecture component of the course can only begin to outline these frameworks, the eBB supports an on-line student-centred learning and assessment strategy that enables the individual student to achieve deeper learning. Within the eBB environment students have the latitude to exercise their own critical choices and powers of persuasion to focus the assessable content and discussion of the course on specific exemplars and discourses of design, past and present, that particularly intrigue them.
As on-line learning tools become more and more familiar across the curriculum, the use of the eBB in this second year core course goes beyond the primary focus of first year courses on tool-learning. It begins to apply and further develop students' ability to think through these digital tools as strategic media for gaining critical insight into the theory and history of design thinking. In this regard, the nature of the eBB as a "discourse" in its own right makes it a particularly apposite medium in which the reflexive critical skills with which the course is principally concerned can be cultivated. The basic pedagogical objective of e-BB discussions is therefore to stimulate an informal but accountable dialogue between students, extending and complementing the dynamics of live tutorial sessions, to help them sharpen their critical grasp of the course content and issues. On a more pragmatic level, the eBB is also intended to support and encourage the exchange of useful information (such as bibliographical references, tips on model-making, computer graphics, etc.) pertinent to tutorial assignments and students' self-directed study. Further announcements regarding the course, including clarifications and/or adjustments to the submission and assessment criteria - the 'rules of play' as it were - are also issued from time to time through the eBB.

But how is the eBB game-like, and why is this analogy useful for this particular pedagogical application?

As a discussion board the eBB can be regarded as a digitally determined and bounded space in which a form of communication game is played. In this 'game space', as it were, players make 'moves' in the form of statements and/or responses. Play is governed by the default constraints of the software on which it resides and specified rules of play that insure the efficacy and equity of the exercise as an assessment instrument. In terms of its specific content, the eBB could also be described as a simulation or role-playing game. Students seek points and peer recognition by rehearsing the argumentation and the new theoretical language they are encountering in lectures and their readings in a form of discourse simulation game in which they emulate the historical debates and contemporary critical discourse addressed in the course. Different e-Tasks require students to play different roles in the evolving discussion and occasional debates: proponent versus opponent, for example, or architect/designer versus scholar/critic. In so doing they experience different points of view and begin to sort out the logic of unfamiliar new thought from the cant of fashionable jargon.

In isolation, the set of e-Tasks could be regarded as just a curriculum; that is a defined sequence of requirements that a student must fulfil in order to get a passing grade. The 'rules' in this regard are relatively prescriptive. The e-Tasks comprise a significant assessable component of a student's overall grade for the course hence participation in the eBB is effectively compulsory. Every student enrolled in the course is expected to visit the eBB and post a contribution at a minimum once every week during the 12 weeks of the teaching semester. Minimum compliance with this requirement keeps one in good standing and can be met by fulfilling the scheduled weekly 'e-Task' and posting it at the eBB site before the indicated deadline. Late or missing submissions result accordingly in prescribed deductions from that student's overall grade for the course.

To insure equity in the use of the eBB as an assessment instrument, any student who adequately completes all the prescribed tasks is assured of gaining a passing grade. But conventional curriculum design can too easily be reduced to such a 'bottom-line', in our view. Students come to expect that all they need to know is that which can be clearly and objectively prescribed. But design knowledge and the manner of aesthetic and critical judgment with which this course is specifically concerned can only partially be grasped in such terms. This is where we believe the game analogy makes a difference in the approach described here. Merely going through the motions, as it were, and meeting the schedule and the specific requirements for each successive e-Task - that is, strictly as a prescribed curriculum - does not necessarily entail that one is 'in the game.' Any student seeking a distinction in this exercise has to really 'play the game' of critical discourse in a genuinely engaged and distinguishing manner, that is by leading and shaping the discussion through more frequent and/or significant contributions to the eBB relative to the consensual norm. This entails critically discerning attention to both the specific issues at hand, supported by
pertinent references, and the state of debate and understanding in that regard among their peers as discerned from other viewpoints and arguments published on the eBB.

One typical e-Task, for example, requires students to contribute to one of several nominated discussion topics with references to recent lectures, their current readings, and other students' comments. If none of the on-going discussions sufficiently intrigues a student they have the option to initiate a new 'theme/discussion topic' by posting under that heading a relevant and stimulating opening statement and/or question, duly resourced with supporting references. One measure of success in the latter case would be the number of further contributions or counterpoints to that leading statement that it attracts at that stage of the exercise or indeed later on in the course as the context and relevance of the original point change in the light of subsequent issues and learning.

In another e-Task, students are required to first publish a draft of their text in progress for a later assignment in order that each student can then play the role of a peer reviewer and read and comment constructively on at least one other student's draft (Response). A particularly keen and motivated student, recognising the benefits of critical feedback, might exploit the opportunity in this case to revise and re-submit their draft for a second such peer review before submitting the final version for formal assessment by the teaching staff.

In our view, the defining difference between a generic curriculum and the eBB, as a game-like learning exercise about design discourse, is its open-ended nature. Like design itself, the game within the exercise is never really over until time runs out. The student always has the option to 'make additional plays', in a sense, by re-submitting improved or alternate responses to the submission criteria up to the specified deadlines for each stage of the exercise. This element of dynamic change and hence uncertainty about the termination conditions encourages students to log-on regularly in order to keep on top of any developments and to extend themselves further as the general calibre and sophistication of play improve.

Thus the 'rules' of this game are not regarded as regulations so much as guiding constraints that in fact enable a more focussed and potentially successful learning effort. Complying with the rules in the sense of playing the same game and thereby respecting the same constraints as the other players is a necessary condition for success. However, 'winning' in the narrow sense of triumphing over others in a competitive game is not the goal. There is no zero-sum gain logic to success in this game, and any number of players can excel.

A practical motive for conceiving of the eBB as a game-like exercise constrained by self-evident rules was to build-in incentives to students to self-administer their performance and the timely submission of assessable work, with transparent accountability and efficiency from the point of view of course administration. The largely implicit, constraint driven rules of the game are instrumental in insuring that the assessment of the exercise remains relatively efficient and hence feasible. But the eBB is also a broadly effective communication medium because of its potential to open up discussion in a democratic manner that gives each student equal space and power to express themselves in a manner far less inhibited than is often the case in 'live' face-to-face tutorials. In the open-ended game of the eBB students have a significant stake in the shaping and success of the discussions it supports and, not least, the evidence it furnishes of their progress with regard to the learning aims of the course. Whilst supporting a substantially qualitative exercise, users soon discover the handy quantitative and cross-indexing features of the eBB’s adopted template, which effectively enable them to keep track of their own performance in the game relative to the field of other participants.

In the original conception of the eBB as a game-like approach to learning about the discursive nature of design theory and criticism, a purpose-built discussion-support software had been proposed that, among other features, would automatically calculate citation rates - a potentially very useful measure of performance in debate - and somehow display this and other quantitative performance data in some form of dynamic graph. In the event that a simultaneous institutional commitment to on-line learning compelled us to adopt the more generic discussion board template we have described here, the implementation of the eBB has to date been less than optimal with respect to specifications. Nevertheless, from the point
of view of design learning this contingent, sub-optimal, "in-progress" version of the eBB is a good lesson in its own right of what Herbert Simon (Brand on Simon, 1997) refers to as the 'satisficing' (sic.) nature of most design solutions to complex sets of criteria. In this sense, the existing eBB and related assignments are also heuristic devices for immersing and even provoking students into a critically reflective frame of mind. The idiosyncracies of the software employed arouse the critical attention of the students to these digital media themselves and related key issues of representation in design-thinking and professional communication with which the course is substantively concerned.

Particularly revealing in this regard is the major assignment involving on-line textual and spatial composition (Project 2), which is performed entirely within the game-space of the eBB. The game-like dynamics and objectives of this exercise are discussed in the following section.

**Project 2: A Feel for the Game in 4-D**

In this section we describe the task, objectives and dynamics of the major assignment for this course on the theories and history of 20th Century Architecture and Landscape as a further on-line strategy for exploring architectural discourse and form by analogy to games.

This exercise (Project 2) requires students to explore relationships between the ideas and forms of two different 20th century architects or landscape architects of their choosing. The work of the selected designers must be topical or otherwise critically addressed in current discourse and therefore visible and accessible through scholarly publications. The choice of designers must also reflect a formal or otherwise critically intriguing relationship between their respective bodies of work and ideas - the Brutalist ethic regarding 'honesty of material' as a link between Glen Mercutt and the Smithsons, for example, or the latent spiritualism in the minimalist modernist forms of both Tadeo Ando and the Indian based Quaker architect, Laurie Baker. The challenge is to discern and articulate an argument about that relationship that will develop and thereby demonstrate a student's understanding of how that work can be situated in the discursive framework of contemporary design thinking and practice.

The specific submission task for Project 2 is to produce what we describe as a four-dimensional composition. This comprises the writing of short but critically rigorous and referenced text of approximately 800 words composed in conjunction with an on-line (3-D) spatial composition. These spatial and textual components of the composition are required to articulate each other in close juxtaposition - that is, as a "4-D" composite - in a complementary rather than a redundant manner. Whilst the text works to name and describe the relationship between the work in question in a conceptual and critical manner, the spatial composition serves to frame that relationship in its own distinctly formal/spatial terms and, hence, in an immersing and experiential manner.

Project 2 is an exclusively digital exercise, submitted and presented through the eBB, that mirrors the basic task and objectives of an earlier exercise (Project 1) conducted in physical media. This juxtaposition is intended to impart practical knowledge and instil reflection regarding the critical differences between the principal representational media that support and frame the formal (ie. non-propositional) discourses of contemporary design. (In the most recent offering of the course these physical and digital exercises in spatial composition were carried out in parallel in a single expanded major assignment.) In this way the major project seeks to further the critical aims of the course by directly engaging students in a creative investigation of relationships between theoretical intentions and formal conventions in architectural and/or landscape design, and the representational tools that mediate these. The project also entails an exploration of the critical relationships between contemporary tectonic/spatial languages and theories, and their immediate historical context in the modernist/postmodernist design discourse of the 20th century. In so doing the exercise also serves to enhance skills in critically interpreting published writings and projects, and to thereby enrich and focus the student's own design perception and communication skills.

As a learning and assessment exercise, Project 2 can be regarded as a further simulation game closely allied to the game-like dynamics of the e-BB. In this case, however, the game
analogy operates in two distinct ways: (1) as a simulation game challenging the student to emulate the formal and conceptual work of influential designers, and (2) as a critical device for revealing and critiquing the games that these designers and their interpreters could be said to be playing themselves. By attempting to capture the qualities and complexities of the selected architects' works in a short text and a relatively simple 3-D composition, as this game-like exercise requires, the question arises whether such work can be distilled to just a few concepts and 'moves', as it were, and what such a reductive representation leaves out. Questions of representation are heightened in this exercise by the requirement to playfully explore and, in this sense, 'discover' formal relationships between the work of two different designers, rather than simply representing the work of one or the other in terms of slavish formal cliches.

Like the eBB, Project 2 is an open-ended game that only terminates once the submission deadline is passed. Students tend to excel when they engage enthusiastically in the game, working not merely 'to rule' in terms of the minimal requirements of the assignment, but by extending themselves beyond prescribed expectations through critical attention not only to their own progress but to the work of their peers as well. All past submissions, such as the pre-final 'esquisses' for project 2, are easily accessible for scrutiny at any time through the eBB. Students can thereby gauge their own performance against their peers as they go along.

Through the game-like conventions and constraints of the eBB, the 'game-space' of Project 2 extends into the realm of a 'virtual space' framed by the default constraints of a particular spatial representation medium, VRML. This tool was adopted because VRML offers a medium for exploring form and narrative in real time. It is also portable across the internet. VRML also introduces an interesting dynamic to the game because it has an open code structure. This enables easy imitation, thereby encouraging progressive and continuous innovation by the would-be 'avant garde' of the class - another dimension to this simulation game that presents opportunities for critical reflection on the inherent "progressivism" of modernism and its implications for recent design history. On the other hand VRML dispenses with the normal niceties of reflection, shadow and fixed-sequence animations associated with traditional CAD. Like the typical simplification and abstraction of game-worlds, the relative crudeness of VRML does not easily enable the time and digital resource-consuming fetishization of more realistic CAD tools. It constrains the players of this simulation game to make simpler and generally clearer and stronger formal statements. Another constraint that tends to hone the game-like challenge of this exercise is a digital cost restriction to a maximum file size of 500Kb for the VRML submission. Whilst this is largely a practicality to insures the easy and rapid display of VRML files on-line, it is also a digital analogy to the strict dimensional envelope and material cost restrictions imposed on the first round of this exercise (in physical media) in Project 1. The majority of students come to recognise that these constraints, like the rules of a game, are an opportunity rather than a hindrance. They circumscribe a discrete and tangible common space of possibility in which the player can exercise her or his ingenuity in a medium commensurable with the performance of others and hence conducive to self-directed learning.

In the following section we make some direct observations of the actual dynamics of Project 2 in practice, with a particular focus on the role of VRML in that exercise.

Observations

This section offers a series of discrete observations regarding student performance in the first round of eBB-based games introduced to 20th century Architecture and Landscapes in 2001. A number of theoretical aspects of gaming in design arising from these observations, including specific issues in the use of VRML as the CAD platform for these games, are addressed in the final three sections.

Project 2 produced a variety of spatial compositions of varying ambition, and digital and conceptual sophistication. Compositions that stand out include those which:
were easily graspable, straightforward, obvious, blissful and sophisticated (Legoretta and Troppo);
employed a Rubik's cube type orthogonality (Koolhaas vs. phenomenology of Steven Hol);
demonstrated different approaches to the task from introspective/architectural to expansive/landscape scaled spatiality (Ando in the red forest);
included multiple readings depending on the viewer's orientation ('star-helix' composition re. Cox and Wooley);
provided a succinct array of spatial experiences (Brutalism of Mercutt: ethic or aesthetic?); and
spiritual emphasis (Baker and Ando).

Commentaries accompanied the 'spatial compositions' on the eBB. Dialogue included positive criticism of the overall process and that of the use of VRML. This dialogue, in particular, highlights the exercise's value as a reflective medium (Schon, 1983). A highly valued skill in graduates of professional degrees (Biggs, 1999).

The following are some reflections on the 20thC Architecture Project 2 VRML 'spatial compositions':

- Despite the eBB facility being an open forum students did not use it to answer each other's queries regarding the 'how to's' of VRML. They did not establish a section of the eBB dedicated to FAQ. This was manifest by those students who didn't know, for example, transparency was supported. Though, as described earlier, this nevertheless produced interesting results. The ideal of the eBB as a self-serving instrument of inquiry, which could reduce management load, was, thus, not fully realised.

- A reluctance on the part of some students to accept the rules included those who complained that VRML didn't give the 'nice' images that FormZ renderings do. These positions represent those that Swartz (1997) describes as subordinate -having not fully mastered the rules of the game.

- Many students displayed a disposition to pre-existing CAD animation paradigms such as those created in FormZ or 3Dmax. They relied on the default Blaxxun browser's automated scroll-through camera view function to create animations on-the-fly. Other self-imposing rules included models viewed from outside as objets d'art. Another is the case of a student who ignored one of the central rules of the game -realtime navigation of the model. Instead they substituted a QT animation. The reaction from other students was predictably "you can't do that!" this is what Hubbard (1980) describes as a preponderance to 'stick' to the rules at all costs. After three hours of immersive model viewing, this created a distinct 'compression' in expectation of what could be explored. After some probing it was revealed that the QT was used because "show more with an animation than the model". The real issue was that they couldn't get the 'quality of imagery' they wanted through VRML. They were frustrated by the rules. Their lack of mastery of the rules meant their submission did not conform to 'the game'. They were not playing the same game as everyone else.

- On the other hand, those Students who gained a firm grasp of what VRML could do displayed a masterly understanding of the rules of the game. They shared a similar disposition toward the game or Habitus. They used it expertly to demonstrate their models in real-time -taking us on a journey whilst narrating a story as they went. Others relied more on the narrative and less on the exploration of the model. The opportunity through masterly understanding of the rules of the game meant that perfection within the game was achievable. These are 'plays' that will be remembered and recounted. Moreover, they inform future 'game-play' strategies.

- Another rule that emerged was the use of a ground-plane. Some models provided ground-planes and others didn't. Those that didn't often worked better. Equally, a rule imposed by the CAD modelling paradigm used to construct the play pieces was orthogonality. There was pronounced orthogonality to most of the student's digital spatial compositions. The modelling packages impose their own rules on the playing
pieces used in the secondary 'framing' game. It is easier to array objects along the x, y, z, axes in most CAD packages. This is often hidden in CAD renderings because output is often strongly grounded. Objects in a VRML scene, on the other hand, do not have such a strong grounding, hence, we see their orthogonality more clearly.

**Cultural Capital**

The game-like nature and learning potential of the interactive discussions and form-making exercises supported by the eBB may be better appreciated through further discussion of three theoretical aspects of game-playing which have particular relevance, in our view, to the critical interpretation of recent architectural history and theory. The first is the matter of the player's (agent's) cultural capital.

Each student comes to the game with their own 'cultural capital'. Cultural capital can be described as what distinguishes those in the cultural 'know' from those not. Bourdieu and Wacquant (1992) liken cultural capital to the chips in a game of poker. The piles of chips reflect the "unequal distributions of capitals that both summarise the results of previous struggles and orient strategies for the future" (Bourdieu and Wacquant, 1992). Cultural capital relates also to the stock one has in accepted cultural currency. For example, partakers of art provide the capital for the artist, who returns it in the form of recognisable cultural productivist collateral. "The opposition between 'rare' practices and 'vulgar' practices in culture corresponds to the main opposition in social space between those classes with considerable 'overall capital value' and those with little.... Evaluations of students' written work that differentiates writing styles in opposing terms, such as elegant/laboured, simultaneously discriminates between students with different amounts of cultural capital" (Swartz on Bourdieu, 1989, 1997, pp130-132).

In the case of the digital composition that students were required to produce for the final major submission of the course (Project 2), the more skillful digital-makers in the class already had considerable cultural capital vested in FormZ, the only CAD program in which students had gained any significant instruction and user-experience by that stage of their undergraduate Design Studies curriculum. But Project 2 posed an unexpected, initially unwelcome challenge, as it required them to work exclusively with another program, VRML. The rules of the game had changed.

According to Swartz (1997), cultural capital that is equally shared among contending parties is represented by rules. New players 'give up' an initial investment in their cultural capital for entry, "which involves recognition of the value of the game and the practical knowledge of how to play it" (Swartz, 1997, p-126). Cultural capital invested in other CAD paradigms was traded for the 'start-up' cost of moving to VRML. Players unwittingly reproduced or changed class distinctions between fields, CAD and realtime 3D, for example, by "pursuing their own strategies within the sets of constraints and opportunities available to them" (Swartz, 1997, p 134).

To start with, at least, the new rules of VRML theoretically put everyone on a level playing field. Like the formal languages of architectural design and discourse that students were challenged to emulate and critique in this project, one had first to learn the basic moves and constraints of the game if one was to play it. With time, however, students developed a 'feel for the game' by "pursuing their own strategies within the sets of constraints and opportunities available to them" (Swartz, 1997, p 134). Distinctions within the class between skilled and unskilled CAD-users re-emerged in due course, but those who stood out were not necessarily the previously established digital wiz-kids. In this regard, genuine creative and critical skill development was demonstrated in the player's emerging appreciation of the distinctions between the instrumental operation of a system, such as the operating rules and constraints of a CAD package (or an architectural 'style' for that matter), and the formal principles of that system on the one hand, and one's capacity to 'perform' in or through it on the other. The artfulness of one's play depended as much upon one's 'disposition' with regard to the constraints, as it did upon an individual's accrued capital of prior skills and knowledge.
Disposition

Having a 'feel for the game', as Bourdieu characterises his notion of habitus, is acting within a system of dispositions which consists of both the "cognitive and volitional structure' and the 'socially structured situation' in which the agents' goals, interests and positions are defined" (Bourdieu, 1977). The artful player of a game, or a piece of orchestral music (as Bourdieu illustrates his point), performs creatively within the structures and principles of a complex interdependency. But the sense of order that guides their performance most pervasively is not the overt and directive authority of the coach or orchestral conductor, Bourdieu discerns, but "the principle of the conductorless orchestration? which gives regularity, unity and sytematicity to practices even in the absence of any spontaneous or imposed organization of individual projects." (Bourdieu, 1990, p 59).

In the game situations in question (the eBB and Project 2) players tended to quickly develop a working consensus regarding the parameters and possibilities of the VRML platform and, in the most successful cases, individually adopted open and productive new dispositions in that regard. They adjusted their desires to what [they believed] was attainable and 'got-on' with the game (Elster, 1983).

Given a choice, most students might have preferred to continue using FormZ, and create beautifully rendered compositions as they were accustomed to doing in previous courses. VRML, a seemingly cruder modeling tool, did not provide for some of the 'niceties' that FormZ could, such as reflections and shadows. But these constraints were offset by other features from the viewpoint of the teaching staff, not least the possibility to view VRML from any networked terminal in real-time, which in turn opened up other directions for effective communication and expression. Compelled to work in VRML, however, most students took a 'satisficing' approach and 'made-do'.

Nevertheless, consensus was not necessarily shared as to what could and could not be done in VRML. At least two different working understandings took hold. One subgroup decided that transparency was not supported by VRML. This self-imposed rule influenced their work, resulting in clear distinctions from the tendencies and possibilities explored by other more inquisitive peers who 'looked under the hood' of VRML and found out how to achieve transparency effects after all. The latter subgroup acted strategically rather than strictly rule or norm conforming. They held aspirations that pushed the boundaries of what was thought to be possible from initially perceived conditions. This stemmed from adopting productive alternative dispositions with respect to new structural conditions (Swartz, 1997), rather than simply reducing the scope of established competencies where these were not directly supported.

Play

A further theoretical aspect of the game/design analogy worth considering briefly in conclusion is the notion of 'play' inherent in the idea of gaming. Games are for playing. Work, on the other hand, is about producing.

A defining trait of the modernist ethos, it has been suggested, was the need to know that what one did was "the way it [had to] be." Arbitrary rules and customs were abandoned in favour of goals and actions justifiable in utilitarian terms. The modernist condescended to play a game only in the belief that subscribing rigorously to the rules of play would achieve some autonomous rational purpose (Hubbard, 1980, pp 52-54).

The learning 'games' we have described and analysed in this paper were certainly designed as productive exercises within the framework of a course curriculum. They demand considerable work from the students, and this is instrumental in turn in producing assessment
results. Nevertheless, both the formal and the discursive outcomes of that coursework have tended to be irrepressibly playful as well.

For a course largely concerned with the history and critical exposition of 'modern' thought and form-making in architecture, this playful, seemingly light-hearted analogy between designing and gaming with which we have been working so intently in these exercises presents an interesting paradox. Can one, or should one reduce the transcendent program of modern architecture and design-of 'form follows function'-to a mere exercise in (game-like) complicity and convention? This, of course, is precisely the manner of questions that we believe such a course needs to ask if it is to take its own mandate seriously and equip design students with cognitive tools-not just critical impressions-with which they can begin to probe past experience and build their own theories about design form and thinking; to gain their own feel for the game.

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