Grounds for Learning

Schoolyard activities as provocations, scaffolds and mediators for childhood learning.

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Abstract

The nature of relations between learning and environments has exercised the minds of philosophers and researchers since at least the time of Plato's Academy and it remains a question that fascinates educators, human geographers, and neuroscientists. As cities grow and children's activities are increasingly restricted to places that are designed and controlled by adults, researchers warn that learning-environment relations are no longer of purely academic interest however. Compelling evidence now suggests that Western children's physical, mental and social wellbeing is at risk. In response, advocates highlight the ways structural factors constrain children's ability to access and use outdoor areas and, today, emerging evidence indicates that they are having some success in driving change. Institutional adjustments are being made. For example, recent Australian legislation requires early childhood centres and schools to provide environments that enhance outdoor play opportunities. Simultaneously however, some reformers suggest reducing the time available for schoolyard play and extending periods of direct instruction. Leading thinkers are calling for a reorientation of 21st century education however. Rather than delivering more instruction, they advocate moving from an emphasis on teaching predetermined content to a focus on developing the dispositions and competencies that enable learning. Internationally, there is renewed emphasis on the role of learning environments in transforming education, but to date, interest is concentrated on built forms, curriculum content and teacher pedagogies. Indeed little research documents relations between learning, children's self-chosen activities and the objects, meanings and practices that constitute schoolyard activity. As a result the hidden curriculum of many school grounds continues to express 19th century 'child saving' models.

Grounds for Learning responds to contemporary evidence that everyday experiences of place influence children's health, wellbeing and learning. The study adopts an ecological approach to research that examines the contexts and detailed histories of children's activities in an outer-suburban schoolyard that is conceived, developed and maintained as an educational resource. By concentrating on a small number of children the research is able to discern sometimes-minute changes in children's everyday interactions with objects and gain privileged insights into the processes by which these are related to dispositional learning. The diversity of schoolyard resources and freedom to interact with and transform artefacts, places, and practices, emerge as key factors influencing three levels of children's learning. First, interactions with schoolyard objects and spaces inform *what* children learn. Second, embedded case histories reveal that engaging with artefacts and practices mediates *how* learners participate in the social and physical milieu. Third, examples demonstrate that resolving contradictions between different elements expands children's understandings of *where* activities, which intersect with schoolyard hidden curricula, may reconfigure larger systems. Conclusions suggest that enriched and liberating schoolyard environments afford higher-level learning through processes of mediation and active re-construction. In coming to this conclusion *Grounds for Learning* adds detail to current understandings of processes that enable children's schoolyard learning and suggests a means to reconceptualise school grounds as powerful resources serving 21st century educative purposes.

Declaration

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Paul Johnson

December 2014

Acknowledgements

Even before I became aware of it, this thesis was in formation. Over the course of fifty years it was in the muddy hands of a child, on camp with other adolescents and brought forth in a teacher's kit, a partner's eyes and a father's joy. Years afterward I have no way to recall everyone involved in those formative experiences and can only imagine the influence of unseen others.

More recently, construction of *Grounds for Learning* has been a conscious and collective exercise so I am able to acknowledge some of the organisations and individuals who contributed to it:

> The colleagues, students and community of Deepwater[1] Primary School, both past and present, whose vision inspired this research, whose open-ness enabled it and whose critical reflections guided it.
>
> The Deepwater students and families who generously agreed to be case study participants and who reviewed and provided feedback on the research.
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I offer my sincere and grateful thanks to all the remembered, forgotten and unknown others who were and are the ground for my learning, without your participation this thesis would not have become.

[1] Deepwater is a pseudonym.

Dedication

For Sally, Tessa and learners like them.

1 Introduction

“All true learning is experience. Everything else is just information” (attributed to Einstein).

1.1 Introduction

This study explores how experiences of activity in an enriched, naturalised schoolyard influence children's learning. The research is situated at Deepwater[2], a denominational primary school that was purpose-built in a space between expanding suburban housing developments and increasingly fragmented post-colonial farmland. One of Deepwater's aims was to integrate an holistic learning programme but the school was selected for study principally because it conceptualised its physical environment as a powerful resource that could inspire and guide learning. Indeed, following educators from the Italian municipality of Reggio Emilia, the school suggested that its "environment can be a teacher" (Deepwater, 6 December, 2010, p.4[3]). Building on this intention, Deepwater's draft *Grounds Policy* (2007) aimed to configure the schoolyard as an educational resource and amongst the Australian, North American and UK research cited the draft suggested Titman’s (1994) study as a guide for developing:

> "*Places for doing;* offering opportunities for physical activities, developing new skills, finding new challenges and taking risks.
> *Places for thinking;* prompting interest, intellectual stimulation, exploration, discovery and learning, alone and with friends.
> *Places for feeling;* engendering a sense of ownership, pride and belonging. Children care for the place and people in it and feel cared for themselves.
> *Places for being;* promoting sense of safety and allowing children to ‘be' themselves, to be quiet, alone or alone with friends" (Deepwater 2007, p.5, see Appendix B).

Deepwater's enrichment and naturalisation of spaces commenced in 2006 and student use began in 2007 but the school's decision to plant its yard with seedlings meant that revegetated spaces would take some years to mature. In the interim, large tree prunings were procured and the school provided hay bales, fabric, sticks, stones,

[2] Deepwater and all other names that might identify the study site or study participants are pseudonyms.
[3] This nomenclature references Deepwater school newsletters.

saucepans and a range of other loose parts for children's use. Children were encouraged to experiment with these resources and were urged to be their own safety monitors. School staff were also inducted into conceptualising their involvement with schoolyard activities as a pedagogical choice that could enhance or constrain children's learning experiences. Thus, in the period of a few months, Deepwater's schoolyard materiality and its conceptualisation of learner agency began to provide an environment that, amongst other things, "freed children to use flowers for creating perfume, vegetation for privacy and time for extended engagement" (M. Grace, personal communication, February 2, 2014).

Images 1a & b. The style of Deepwater's schoolyard and activities. a) Building shelters was a popular and valued practice. b) Small undulations, vegetation, loose objects and water provided places for doing, thinking, feeling and being. (Sources: Deepwater newsletter, Sept. 6, 2010, p.1 & Deepwater video, 2011).

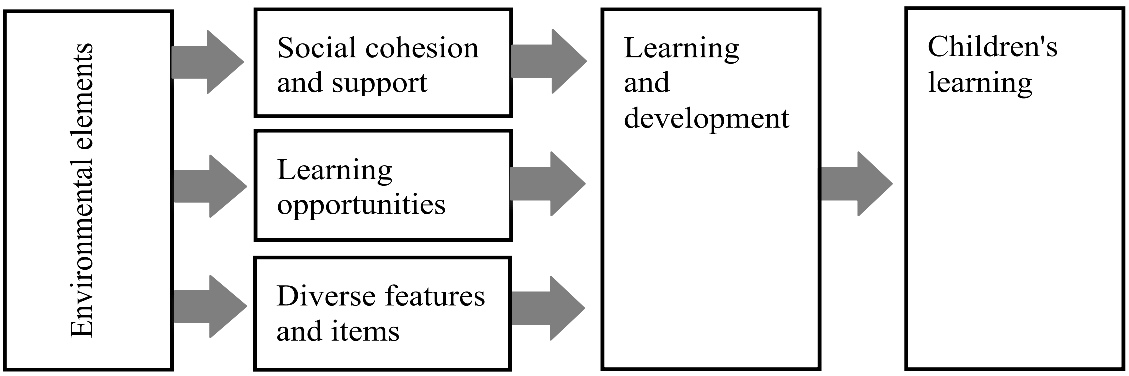
Since Deepwater opened, research (e.g. Bundy et al. 2011), reviews (e.g. Malone 2008, Martin 2011) and texts (e.g. Freeman & Tranter 2011) demonstrating that out of classroom experiences may benefit children's cognitive, affective, interpersonal/social and physical/behavioural development have been taken up more widely (e.g. UNCRC 2013). For example, Australia's *Education and Care Services National Regulations* (Ministerial Council for Education, Early Childhood Development and Youth Affairs 2014, p.67), which were introduced in 2011, require that early childhood education and care providers have facilities that "allow children to explore and experience the natural environment". Australian state governments are also promoting outdoor activity as beneficial for children (DEWNR 2014). *Grounds for Learning's* research in Deepwater's four-year-old schoolyard therefore presents an opportunity to examine how schoolyards that are designed, provisioned and animated as outdoor learning environments may support priorities for children's "physical, educational and mental wellbeing" (Rankine 2014, p.1).

1.2 Aim of the thesis

Grounds for Learning seeks to describe how experiences in an enriched school outdoor environment (the schoolyard) influence children's learning. Wachs (2000) summarises current understandings of learning-environment relationships in *Necessary But Not Sufficient*. He writes that environments influence what a person learns by affecting the learner's state of mind, by providing contexts where past learning can be rehearsed or by stimulating learning. On the basis of evidence from studies of children and adults a researcher may therefore anticipate that experiences of a barren, noisy and crowded schoolyard will affect students' attentiveness[4] (Bagot, Allen & Kuo 2008), learners' ability to practise activities (Epstein 1981) and social interactions that may influence learning (Anderson & Bushman 2002). Similarly, a researcher may reasonably expect exercising to affect children's concentration (Adolphus, Lawton & Dye 2013, Hillman, Erickson & Kramer 2008) and engaging with nature to influence learners' attitudes (Wells & Lekies 2006).

The literature discussing how environments may be involved in processes of learning is less clear however. For example, Martin's (2011) review summarises the relationship between experiences of nature and learning in three steps. First, environmental elements promote (i) social cohesion and support, (ii) learning opportunities and (iii) access to diverse features and items. Second, the conditions promoted by environmental elements influence learning and development. Finally, learning and development are related to children's health, behaviour and learning.

Figure 1. Learning - environment relations. Martin's (2011, p.8) review posits that "diverse features and items" influence learning processes (step 2) then learning outcomes (step 3).



[4] More speculatively Martin's (2011) *Putting Nature Back Into Nurture: The Benefits of Nature for Children* proposes that children who are exposed to soil-borne bacteria may be less anxious, as are mice that are similarly exposed (Matthews & Jenks 2013).

Martin's (2011) review of the literature makes clear that engaging with environmental elements supports both learning processes and learning outcomes. *GfL*'s examination of the research that informs her review and of research cited in other recent reviews (e.g. Blackmore et al. 2011, Ely & Pitman 2012) found no discussion of how experiences of the environment are related to learning processes however - only the cognitive functioning, availability of information and constraining/enhancing influences are discussed in the literature. Similarly, recent original research investigating environment-wellbeing relationships also notes that exploration of environment-learning relationships remains "under-researched" (Engelen et al. 2013, p.324). Earlier reviews also discuss the environment's influence on learning but conclude that research into learning-environment related processes is a "significant blind spot" (Rickinson et al. 2004, p.8). Three mature fields of inquiry that are not discussed in existing reviews do theorise the role of environments in learning however. These are Gibsonian ecological psychology, neo-Vygotskian cultural-historical theory and Batesonian double binds. Together these, and their related iterations, are the means by which this study conceptualises environmental influences on learning processes.

1.3 The framework informing research

Grounds for Learning's literature review explores contemporary systems perspectives on learning then suggests that a synthesis J. J. and E. J. Gibson's (1979, 1992), Vygotsky's (1934/1978, 2004) and Bateson's (1972) theories is required for researching learning-environment relations.

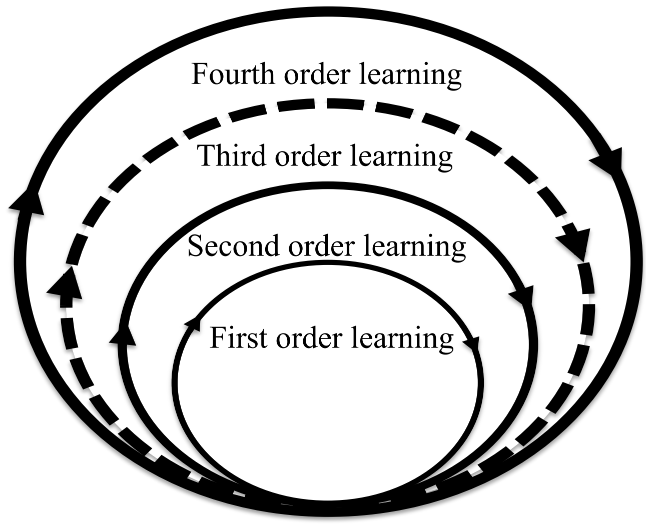
J. J. and E. J. Gibson's ecological psychology and Piaget's genetic epistemology both posit that the environment is a source of information but neither assigns it a formative role in higher-level learning. In the former, ecological psychology suggests that perception is direct and does not require higher-level cognition. For example, a child does not perceive the height, size and shape of an object then mentally formulate an understanding of it as a stool, instead the child perceives that the object either affords sitting-on or, if the object is unsuitable (e.g. a bar stool that is too high for a child), not-sitting-on. Thus, ecological psychology identifies learning as perception of the action potentials an environment affords relative to the capacity of the individual. Some proponents of ecological psychology go further and also suggest that experience educates or calibrates perception so that classes of affordances become recognisable (Jacobs & Michaels 2007), a process that Harlow (1949, p.51) calls "learning to learn."

Piaget and followers also discuss learning as a situated activity but suggest that dual processes are required. They are, (i) assimilation, which incorporates environmental information into existing mental constructs or schemas, and (ii) accommodation, which adapts schemas when experience of the environment promotes cognitive dissonance. In this explanation the environment provides content that may be assimilated when maturational processes have prepared mental "instruments or structures" (Piaget, Gellerier & Langer 1970/1988, p.14) that are capable of accommodating experiences.

Piaget's position that higher-level learning originates in cognitive maturation, not experience, can "never lead beyond the system itself" (Jones 1999, p.42) and therefore excludes the possibility that the environment may be a formative influence on higher-level learning. Vygotsky (1934/1978, 2000), on the other hand, conceptualises the social environment as leading higher-level learning. In Vygotsky's explanation the signs and symbols related to language are cognitive tools that make other-levels of learning possible, first with social support and then independently. More recent elaborations of Vygotsky's theory posit that other cultural artefacts may also function as cognitive tools (e.g. Cole 2005b, Stetsenko 2009) and, in this, neo-Vygotskian explanations of artefact-scaffolded learning meet Deepwater school's Reggio Emilia inspired concept of the environment as teacher. Interpretations of Vygotsky's (1934/1978, 2004) theory vary however, and Miller (2011) discerns two distinct streams. The first, primarily North American, is consistent with views that identify the environment as a source of learning-related information that becomes available through associative or social exchange processes. The second interprets Vygotsky's key contribution in terms of mediation that allows cognitive tools to be used by others. Miller (2011) writes that mediation has the effect of regulating interactions so that a learner may interpret information from another agent's perspective. For example, a map does not transfer what was in a cartographer's mind but it can allow the viewer to perceive the environment from the cartographer's perspective. Moreover, if that map presents alternative perspectives on something the viewer considers familiar, the viewer may reconstruct their familiar conceptualisations using cognitive/perceptual tools the cartographer has liberated. That is, the map will have mediated the viewer's understanding of the environment.

From neo-Vygotskian conceptualisations of maps, artefacts, signs and symbols as mediators of other-level learning, a relatively short journey follows Engeström's (1987, 1990, 1999, 2001, 2007, 2009) discussion of learning as expansion to the framework of learning Bateson (1972, p.284) based on Whitehead & Russell's (1910) 'logical types'. Briefly, this framework proposes that concurrent and interrelated cycles of learning occur at five levels[5] (Figure 2).

Figure 2. Bateson's (1972) nested orders of learning (adapted from Tosey 2006, p.6). In this framework zero order learning is reflexive (so is not represented here), first and second order learning occur concurrently while third order learning requires the resolution of contradictory environment-sourced messages. Fourth order learning represents the interplay of genetic and experiential factors and is not expected to be part of an individual's experience.



In Bateson's conceptualisation zero order learning is no learning and first-order learning assimilates reliable information about the environment (e.g. recognising what response reliably follows an action). Second-order learning contextualises first order learning either through identification of continuities or by social exchange (e.g. how to produce the reliable response). Third order learning contextualises second order learning but only after expanded understandings resolve experiences of discontinuity (e.g. a learner's attention is drawn to higher-level conditions because a previously reliable response does not occur as anticipated). That is, third-order learning is generative. Fourth order learning is theoretically possible if it produces changes in genetically determined characteristics within an individual's lifetime. Bateson (1972, p.298) notes however, that fourth order learning "probably does not occur in any adult living organism on this earth" because the evolved systems that enable and constrain

[5] Neisser's (1994) interpretation of Gibson (1979) proposes a similar two-level conceptualisation but does not consider mediation as a tool for moving between levels.

understanding (e.g. visual perception) are not expected to be modified by experience[6]. Accordingly Pätzold (2011, p.34) and others (e.g. Down 2001, Sterling 2010, Tosey 2006, Visser 2003) consider level three learning as "the last (regular) level in Bateson's model". As with these authors *Grounds for Learning* (*GfL*) acknowledges the theoretical possibility of fourth order learning but considers third order learning to be the limit of its research.

Taking ecological psychology, cultural-historical theory and logical types into account this study proposes that schoolyard materiality may influence learning in two ways. First, schoolyard materiality may, as acknowledged by the contemporary literature (Wachs 2000), influence what learners perceive and assimilate. Second, perceiving schoolyard artefacts, places and spaces that embed higher-order learning (e.g. maps) may mediate cycles of contextualisation and expansion into second and third order learning. This second proposal is the tool with which *GfL* research questions are conceptualised.

1.4 The research questions

Typically, children (and sometimes adults) describe self-chosen activities as 'play' but, amongst researchers, there is no agreed definition for play (Pellegrini 2009, Rogers 2010, Sutton Smith 1995, 1997). To avoid confusion and remain open to the possibility that any schoolyard activity may be related to learning this study refers to children's activities in and with their schoolyard as 'affordance actualisations'. The key question of this thesis is therefore: how are children's self-chosen schoolyard affordance actualisations related to learning?

In order to develop its research *GfL* seeks to determine answers to a further five sub-questions. They are:

1. What systems configure the study site and how do those systems influence students' affordance actualisations?
2. What potential affordances are available in the study site schoolyard?
3. What schoolyard affordances do students actualise?
4. How are learning outcomes expressed in students' affordance actualisations?
5. How do changes in student affordance actualisations show learning?

[6] Jablonka and Lamb (2005) conceptualise possibilities for fourth-order learning however.

This research takes an embedded case study approach (Yin 2003) and, following Greene, Caracelli and Graham (1989), uses mixed-methods to expand the range of available data to include both observations of children's affordance actualisations and children's interpretations of those actualisations. The primary source of data is video recordings that show five students' schoolyard affordance actualisations through one academic year. Transcriptions of video data, anecdotal evidence and student reflections are the materials that inform this research design's process tracing analysis and discernment of patterns relating processes of learning and affordance actualisations.

1.5 Potential contribution of this study

The study potentially contributes to existing knowledge and practice in four ways. First, by showing the interconnectedness of children's activities with schoolyard artefacts, places and spaces and relating these to existing and emergent relationships, the study can contribute to geography's critical reconceptualisation of social and spatial practice (Gruenewald 2003, Hörschelmann 2011) in the manner of scholars who "foreground" children's geographies (Philo 2000, p.245). This is to suggest, as Cresswell (1996, p.8) explains, "the effect of place is not simply a geographical matter. It always intersects with socio-cultural expectations". Therefore, in its particular way, this study can contribute to a discipline that challenges "socialisation and its deterministic tendencies ... [that] direct the organisation of the major institutions of childhood, from teacher-training regimes to the ethos of school settings" (Gagen 2000, p.601). In this, the study potentially aligns with Foucault (1994) on the productive use of power and Horton, Kraftl and Tucker (2008, p.343) who suggest that such research:

> "could and should contribute understandings of (young) learners' own concerns and lifeworlds, to support the development of curricula and (especially active learning) activities which are more effectively and engagingly learning-centred."

Second, the study may also be of interest to those who argue that the 19th century Western consensus about what constitutes a "good childhood" (de Coninck-Smith & Gutman 2004, p.134) still produces what Fisher (2002, p.6) calls "prisons of learning." In this context, education reformers propose alternative conceptualisations of school spaces (Huse 1995) but, to date, "little attention is paid to ... how design of ... outdoor spaces ... relates to pedagogies and learning" (Blackmore, Bateman, Loughlin, O'Mara & George 2011, p.v) and, unsurprisingly, "the majority of school grounds ... are generally comprised of hard open space" (Lucas & Dyment 2010, p.186). *GfL*'s research in Deepwater's naturalised and enriched schoolyard is therefore well-placed to address McKendrick's (2005, p.17) call for "more detailed research on school grounds' area types and features ... using a case study approach."

Third, although this study does not specifically research play it is likely be of interest to those who do because a range of factors increasingly constrain children's play (e.g. Blatchford 1998, Clements 2004, Evans & Pellegrini 1997, Hood & Malinauskas 2008, Jarret & Waite-Stupiansky 2009, Pellegrini & Blatchford 2000, Tranter & Malone 2004, Wyver et al. 2010, Zigler & Bishop-Josef 2009) and schools have become one of the few places where children are relatively free to choose their activities (Kyttä 2003). Additionally, limited research examines children's free schoolyard behaviour (Pellegrini 2009) and "very few studies examine the combined result of children's play and the interaction with artefacts and peers" (Lindstrand 2005, p.106). *Grounds for Learning* research may therefore contribute to this under-theorised and under-researched area.

Last, by proposing and testing a synthesis of Gibson's (1979) ecological psychology, Vygotsky's (1934/1978, 2004) cultural-historical mediation and Bateson's (1972) double-bind theory this study potentially offers non-psychologists a means to conceptualise and investigate how experience of environments influences the processes of children's learning.

1.6 How the thesis is organised

This thesis is constructed in the conventional manner but with the additional intent of presenting findings, interpretations and constructs in such a way that potential non-academic users may draw their own conclusions regarding usefulness and transferability. Thus the study's four-part literature review follows Bronfenbrenner and Morris's (2006) Bioecological Model of Human Development in positing that proximal processes, contexts, personal characteristics and timing influence learning. Consequently the review begins with a wide-view of proximal processes in learning-environment relationships then the focus narrows to introduce (i) how contexts may influence learning, (ii) systems perspectives on personal characteristics and finally (iii) an overview of three time-related factors.

Following Greene and Caracelli (2003) *GfL*'s *Design of inquiry* chapter outlines the research ontology then describes the research project as an exploratory probe that (i) discerns processes of schoolyard learning and (ii) tests the plausibility of the study's synthesis of three existing theories.

The bulk of this thesis is the results chapter that contains three parts. First, the justification for selecting Deepwater as an influential case offers the reader a sense of the systems in which children undertake schoolyard activities. Second, descriptions of the schoolyard's potential affordances present a reading of the action possibilities that children may actualise. Last, five narratives relate histories of schoolyard affordance actualisations and learning. A synthesis of these three parts is then presented in the study's discussion.

The final chapter of this thesis is a conclusion that brings the literature, study findings and discussion together as an exposition that situates *Grounds for Learning* in the contemporary and emergent academic and policy contexts.

2. Literature review

> *"Each historical period tries to fit together the odds and ends of its limited experience in a world-view, metascience, or philosophical conception which bears close relations with the prevailing style of scientific thinking. ... Lately, biology and the sciences of man came to the fore. And here organisation appears as the basic concept – an organismic world-view taking account of those aspects of reality which were neglected previously. At the same time, this new view realises something which previous ones, in their scientific hubris, had overlooked: that is, no world-view, the organismic included, is ultimate truth or ultimate reality ..."* (von Bertalanffy 1968, pp. 66-67).

2.1 Introduction

In the 21st century von Bertalanffy's (1968) observation that there can be no ultimate truth is uncontroversial; post-structural, non-representational, connectionist and many other schools of thought each offer their own perspectives. Although systems views are criticised as being so broad as to be untestable (Doherty 2000) contemporary social science nevertheless conceptualises environments in terms of recursive, multi-layered, multi-scale relationships[7] and gives attention to the effects of evolving system activities (Fleer, Hedegaard & Tudge 2009). *GfL* embraces the systems view advocated by von Bertalanffy so investigates processes "of mutual influence between individuals in relationships and between individuals and their environmental contexts" (Doherty 2000, p.536). As such the focus of this study is "the interface between people and environments ... not ... the person ... or the environment ... There are no separate actors or events" (Aitken 1992, p.557). Consequently, inquiring into the apparently simple question of how children's schoolyard activities influence learning calls forth theorising in fields as diverse as geography, developmental biology and learning theory. At the same time critical perspectives position child-agents as active participants in emergent systems so an inquiry into human-environment relations also engages with psychological, philosophical and phenomenological concepts. Clearly, intense examination of all disciplines and approaches that take an interest in learning, childhood and place is beyond the scope of a single study so ontological, epistemological and methodological choices must be made. Thus a key aim for this chapter is to develop or adopt a conceptualisation of learning-environment relations that is a good fit with contemporary systems views.

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[7] E.g. Christensen, James & Jenks 2000, Holloway & Valentine 2000, James, Jenks & Prout 1998, Johannesson & Bærenholdt 2009, Johnston & Sidaway 2004, Morris 1997, Pollard & Filer 1996, Rose 2001, Sewell 1992, Wachs 2000.

A second aim for *GfL* research is to provoke and support policies and pedagogical changes that may expand possibilities for children's schoolyard learning. Research demonstrates that educational innovations rarely alter the fundamental nature of teaching and learning (Hattie 2005) without first examining teacher ontological and epistemological assumptions (Winter 2004) however. To progress its aim this review therefore begins with an overview of literature that discusses contested notions of learning (Alexander 2000) in relation to environment. In so doing rhetorics and research are introduced that provide an overview of deterministic and organismic perspectives. This literature is necessarily large and is sometimes traced to its historical roots in order to make visible assumptions about learners and learning that are commonly implicit. Having surveyed the learning-related literature, and whilst acknowledging that valid studies support different schools of thought, *GfL* adopts the systems view advocated by Bronfenbrenner and Morris's (1998 & 2006) well-regarded[8] Bioecological Model of Human Development.

Introduced at a time when psychology largely ignored contextual elements and the social sciences were undertaking a spatial turn (Hubbard et al. 2002) Bronfenbrenner's (1979) *The Ecology of Human Development* helped move the focus of theory and research in human development from decontextualized individuals to persons embedded in multilayered, emergent relationships (Moen 2006). Early iterations of the bioecological model represent contextual influences on human learning and development as four nested systems - a macrosystem, exosystem, mesosystem and microsystem but omit the physical environment as an influence on development. Subsequent refinements account for this omission (Moore 1986) but, although theoretically sound, geographer Aitken (1992, p.555) points out that macro-micro relations "have long been acknowledged as one of the thorniest questions in human geography". Psychologist Wachs (2000) agrees that the bioecological model's proposition of generalizable distal influences is largely untested.[9] Later developments of the bioecological model therefore make a “critical distinction … between the concepts of environment and process” (Bronfenbrenner & Morris 2006, p.996) and

[8] E.g. Ferguson, Cassells, MacAllister & Evans 2013, Peters et al. 2010, Tudge, Brown and Freita 2011, Ungerer & Harrison 2009.

[9] General System Theory (von Bertalanffy 1968) posits two possibilities which may explain why discernment of macro-micro connections is problematic: multifinality or "many outcomes consistent with a particular value of one variable" (George & Bennett 2005, p. 10); and, equifinality or "similar outcomes occurring through different causal processes" (Bennett & George 1997, p.5).

Bronfenbrenner and Evans (2000) introduce the revised bioecological model with a key proposition that reads:

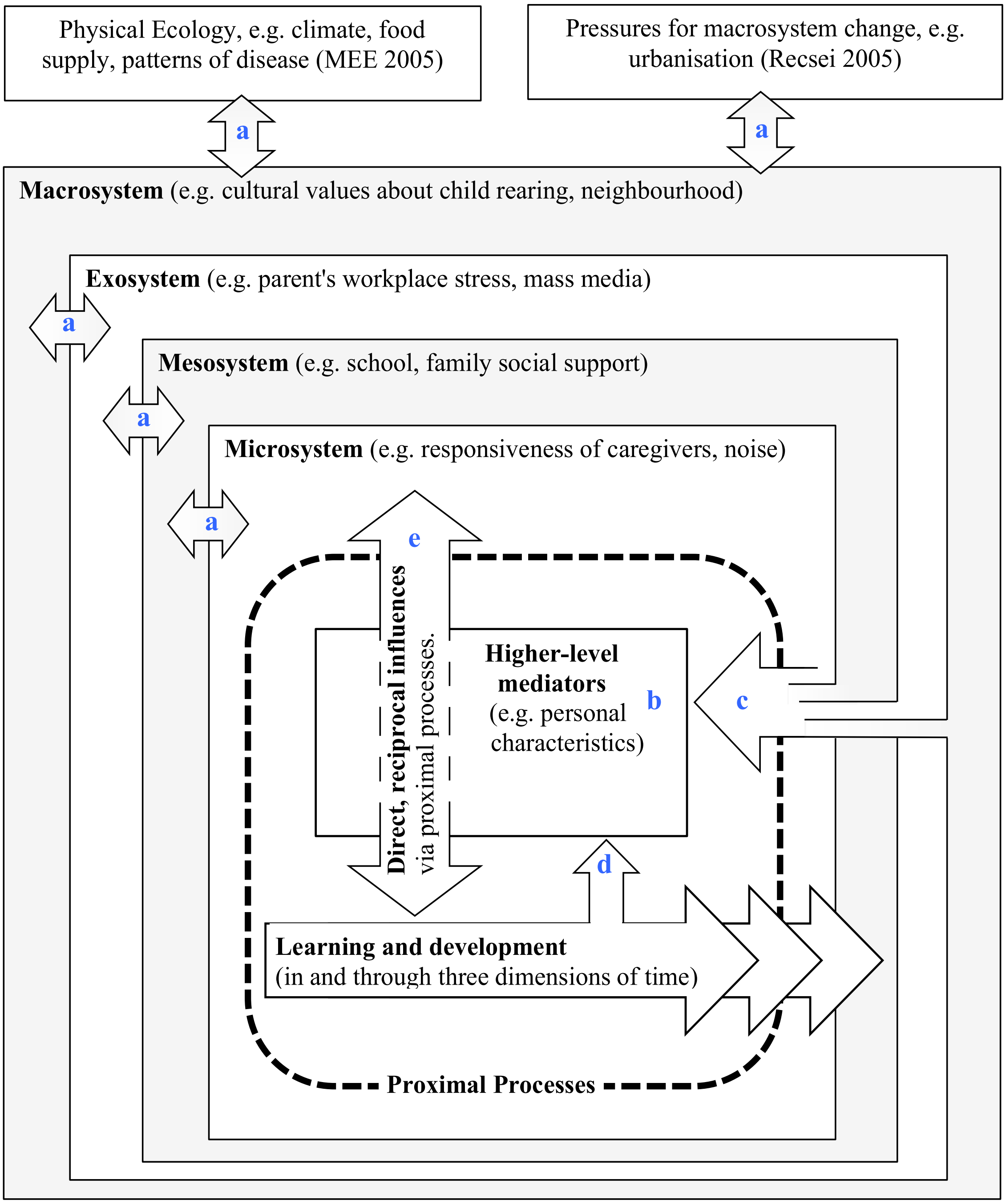
> “Throughout the life course, human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving bio-psychological human organism and the persons, objects, and symbols in its immediate external environment. To be effective, the interaction must occur on a fairly regular basis over extended periods of *time*. Such enduring forms of interaction in the immediate environment are referred to as *proximal processes*" (Bronfenbrenner & Evans 2000, pp.118-119, emphasis in the original).

Expanding on its first proposition the revised bioecological model identifies four factors that influence learning and development; namely (i) proximal processes, (ii) contexts, (iii) personal characteristics and (iv) timing. Figure 3 adapts expositions of the bioecological model presented by Bronfenbrenner (1979) and Wachs (2000) to represent the influence of contexts (via proximal processes, personal characteristics and time) on learning. In this representation proximal processes are conceptualised as the engines of learning and development that act directly or via constraining or accentuating influences. As such, contextual systems influence learning and development *through* and *as* proximal processes. For example, experiencing responsive caregivers is understood to directly influence learning (e) whereas neighbourhood characteristics (c) may accentuate or attenuate personal characteristics (b) and then affect learning and development (d) by influencing an individual's experience of proximal processes (e).

Today Bronfenbrenner's revised and updated bioecological model is “highly regarded” (Wong 2001, p.370) and "influential" (Baines & Blatchford 2011, p.264) so it provides *GfL* and other studies with a systems view that is well-suited to cross-disciplinary research into human-environment relations (Bundy et al. 2008b, Ungerer & Harrison 2009). Accordingly *GfL*'s literature review is structured using the bioecological model's four factors. Tudge, Mokrova, Hatfield and Karnik's (2009) advise operationalizing the bioecological model by focusing on proximal processes and then by showing how processes influence other factors. This review therefore begins by examining proximal processes that influence learning. Second, known contextual effects are discussed. Subsequently, and in accord with the bioecological model, personal characteristics are reviewed as resources, demands and dispositions. Finally, time is conceptualised as a macro, meso and micro element in learning processes.

Figure 3. The bioecological model (after Bronfenbrenner 1979 and Wachs 2000). Double-headed arrows (a) suggest that distal contexts may influence proximal processes, higher-level mediators and learning. Following Bateson (1972) and Vygotsky (1934/1978, 2004) *GfL* hypothesises that proximal processes become provocations for higher-level learning when contradictory messages are emerge from by personal characteristics (b), contextual elements (c) learning (d).

The bioecological model insists that learning and development occur in and through three dimensions of time but, for simplicity, this figure does not attempt to illustrate time's three dimensions nor does it attempt to represent the influence of individuals on their mesosystem, exosystem or macrosystem although direct influences on the microsystem are accounted for with a double-headed arrow (e).



The chapters that follow *GfL*'s literature review respond to systems views which indicate that "the acts, attitudes, and orientations of learning, as well as the social and physical contexts in which it takes place, are interdependently related aspects" (Paradise & Rogoff 2007, p.105) by presenting descriptions of, and reflection on, how proximal processes, contexts, personal characteristics and time relate to children's schoolyard learning.

2.2 Proximal processes: learning

Interpretations of the proximal processes related to learning arise from two markedly different views (Fischer & Bidell 2006) broadly categorised as either mechanistic/deterministic or organismic/voluntaristic processes (Bowler, Annan & Mentis 2007, Johnston 2014).

Mechanistic schools suggest that humans have little control over their learning and development (Cook & Cook 2009, Wyman 2005) and inform a dualism that Galton (1874, p.227) describes as the nature - nurture dichotomy. The nature side of this dichotomy, which suggests that intrinsic factors lead learning and development, follows from Aristotle’s [circa 384-322 BC] ancient writing that suggests that “each human being is bred with a unique set of potentials that yearn to be fulfilled” (Aristotle quoted in Costa & Kallick 2004, p.5) to Christian theology and thence, through Darwin’s theory of evolution, to contemporary science (Atran 1998, Costa & Kallick 2004, Granger & Kivlighan 2003). Nurture views follow Des-cartes [1596-1650], Spinoza [1632-1677] and Leibniz [1646-1716] and, whilst also positioning learners as passive, suggest that environmental factors maintain, facilitate, induce and canalize learning and development (Gottlieb 1991, Moore & Golledge 1976). Gasset (1941, p.217) suggests, for example, that “man has no nature; what he has is history.”

Lao Tzu's [circa 600-530 BC] two and a half thousand year old poem proposing that "Without stirring abroad, One can know the whole world" (Lao Tzu 1963, p.108) shows that organismic views have ancient roots but Western organicism is generally held to follow Kant's (1781/1855) *Critique of Pure Reason*. In this, Kant suggests that thinking and learning can have purely psychological components (Bagnoli 2014). Organismic views are far from homogenous however, differing, for example, in how they resolve the question Piaget (1930, p.238) posed in *The Child’s Conception of Physical Causality*. That is:

> "If the child's mind is active in the process of knowing, how is the collaboration effected between his thought and the data of the external world?"

Within Western organicism various theories respond to Piaget's provocation in different ways; psychoanalytic theories suggest that humans have innate drives and strong cognitive theories espouse internal representations of an external reality. Systems views theorise that learning contributes to and emerges from reciprocal learner-environment interactions however. For example, Harri-Augstein and Thomas (1991, p.3) suggest that "we learn by conversing with ourselves, with others, and with the world around us."

The diversity of mechanistic and organismic views expressed by the likes of Lao, Aristotle, Kant, Gasset and Harri-Augstein and Thomas means that the literature includes multiple and still emerging interpretations of learning-environment relations (Dent-Read & Zukow-Goldring 1997). In this context reviewing similarities and differences between theories can be problematic so, to maintain this study's focus on proximal processes and to ensure that its exposition represents relations between each view, this part of *GfL*'s literature review follows the conceptualisation that Bowler, Annan and Mentis (2007) present in *Understanding the Learner Environment Relationship: A Matrix of Perspectives* (Figure 4). Bowler, Annan and Mentis offer a schematic representation of learner-environment relations by representing mechanistic schools along a horizontal continuum of passive-to-active environment (x axis) and organismic schools on a vertical continuum of passive-to-active learner (y axis).

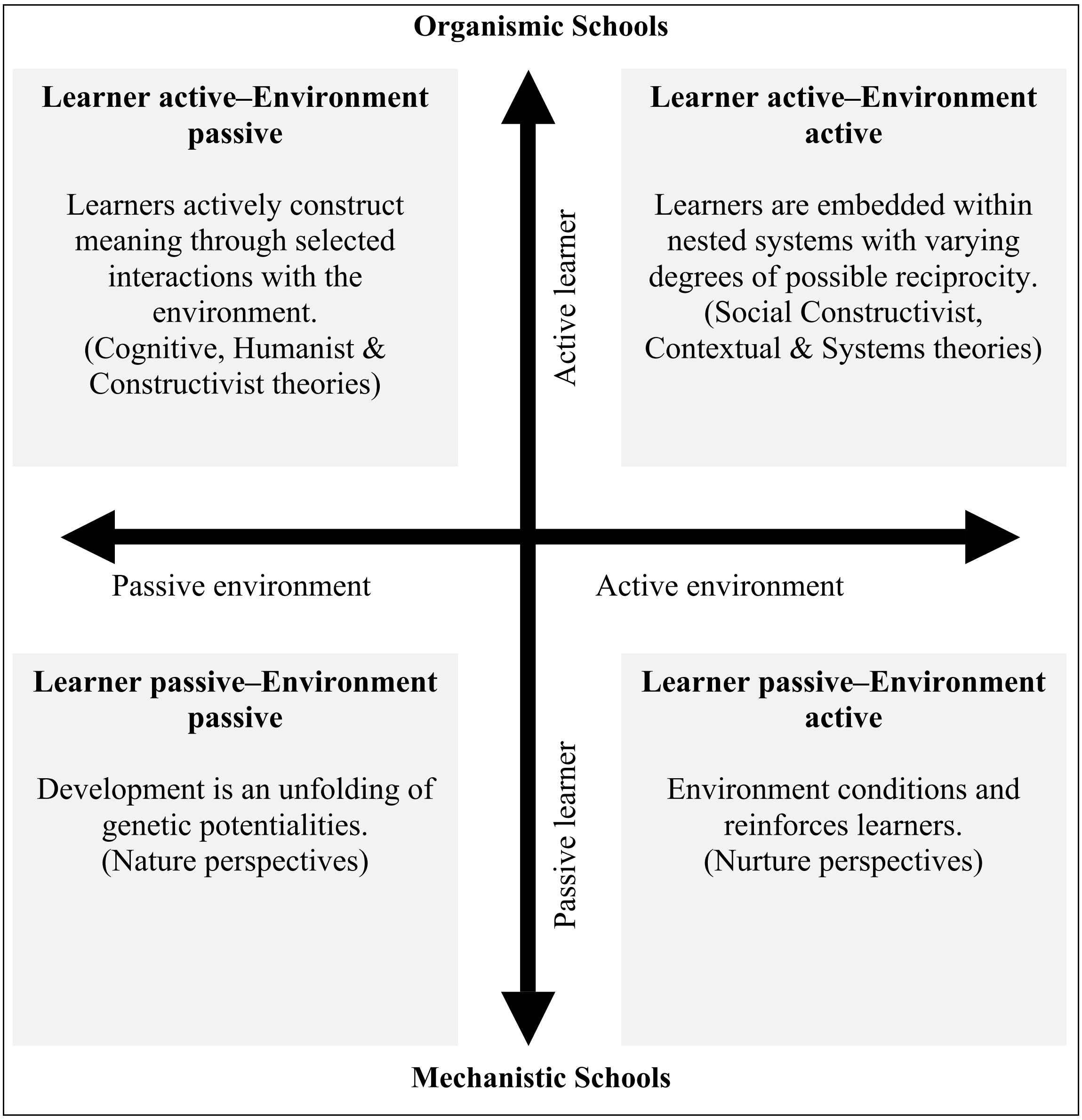
2.2.1 Mechanistic perspectives

Mechanistic perspectives suggest that individuals have little or no control over personal characteristics or learning and that these are largely determined by nature or nurture (Moore & Golledge 1976).

Nature views

Nature views posit that intrinsic factors influence individual behaviour, development and cognition (Bjorklund & Pelligrini 2000, Jablonka & Lamb 2002, Pinker 2004). Strong nature views are predicated on evolutionary history shaping both: species' genetic endowment; and, individual "behaviour, personality and cognition" (Pellegrini, Symons & Hoch 2004, p.55). Contemporary nurture views reject determinism, however, and allow that, to a greater or lesser extent, proximal environmental factors have a capacity to influence behavioural, physical and

Figure 4. Learning theories conceptualised in relation to personal and environmental activity. Organismic schools are represented above the *x* axis and mechanistic schools below. (Adapted from Bowler, Annan & Mentis 2007).



psychological characteristics (Gorelick 2004, Granger & Kivlighan 2003, Jablonka & Lamb 2002, McMichael 2001, Mohr 2003, Oerter 2003, Perrin & Lee 2007, Schoon et al. 2002, Wachs 2006). Gibson (1966), for example, suggests that evolved perceptual systems allow individuals to extract information[10] from species-typical environments. Rowe (2001, p.73) also explains species-typical tendencies in terms of "biases that come with [a] different genetic inheritance" and others propose that knowledge of

[10] Jablonka (2002, p.587) writes that "environmental cues … [become] … informational signals by virtue of the properties of the evolved receiver system." She continues that an input becomes informational "if an interpreting receiver can react to the form of the source (and variations in this form) in a functional manner."

reality is governed by pre-existing mental systems (Chomsky 1965, cited in Moore & Golledge 1978, Geary 1995, Mitchell & Ziegler 2007, Siegal 2008). Still others suggest that environmental factors activate individual genetic potential[11] (Junien & Nathanielsz 2007, Nelson 2000) and, following this line of reasoning, that children should experience species-typical environments (Johnson 2007a). The contemporary nature literature, such as Bjorklund, Periss and Causey's (2009, p.151) *Elucidating the mechanisms of human development: A reply to Dubas* advises, however, that "evolutionary explanations of development certainly do not imply that everything's innate and evolved to propagate the interests of selfish genes". Therefore, rather than seeking deterministic accounts, researchers give attention to how human learning relates to individual and collective (i) information processing, (ii) attention to information in the proximal environment and (iii) participation in species typical activities that scaffold development of innate abilities (Geary & Bjorklund 2000, pp. 61-62).

Although strong nature views no longer hold sway in education (Warin, Kolskia & Sagar 2011) two powerful influences maintain significance for this review because they continue to influence the design and use of schoolyards. The influences are: maturational play theories; and, suggestions that humans innately affiliate with 'nature'.

Maturational theories suggest that play is a "natural part of children's development" (Fleer & Peers 2012, p.417); Fisher, Hirsh-Pasek, Golinkoff and Gryfe (2008, p.306) discuss, for example, "the conclusion that play is a natural, age-appropriate activity through which young children learn about themselves and the world around them". Studies have been unable to identify causal relationships however, and Sutton Smith (1995, p.282) wonders whether researchers may have "been looking at the wrong kind of (developmental) function(s)." Additionally, although developmental views are implicit in much of the play literature (Fleer 2010), a variety of authors point out that there is little theoretical consensus regarding play (Harker 2005, Hewes 2007, Meire 2007, Pellegrini 2005, Rogers 2010 & Sutton Smith 1995 & 1997). To avoid the conceptual and practical difficulties associated with researching play (and perhaps ignoring learning-related activities that do not fit definitions of play) *GfL* focuses on a phenomenological appreciation of children's self-chosen schoolyard activities (during

[11] Environmental factors that influence genetic components within the individual's lifetime are described as epigenetic. Precise definitions, and the degree to which environments affect epigenesis, differ however. For an overview see Dawkins (2004) and Jablonka (2004).

which some children may be playing) in relation to learning. In practice then, *GfL* is informed by the extensive play literature[12] but takes a non-representational view (Thrift 2000) by focussing on affordance actualisations.

A second nature influence that remains current is Wilson's (1984) proposition that humans have an innate need to affiliate with the biological world. In support of Wilson's hypothesis a range of studies and reviews outline circumstantial evidence that people respond in fundamentally different ways to 'natural' and built environments (e.g. Maller, Townsend, Brown & St. Leger 2002, New South Wales National Parks and Wildlife Service 2002, Ulrich 1984, van den Born, Lenders, De Groot & Huijsman 2001, Winter 2004). Mayer et al. (2009) demonstrate, for example, that exposure to natural settings enhances one's mood, cognitive processing and ability to reflect on life circumstances. Such research informs both: contemporary views that conclude access to nature offers physical, mental and learning benefits (e.g. Blackmore, Bateman, Loughlin, O'Mara & George 2011, Ely & Pitman 2012, Martin 2011); and, practitioner views that natural materials and settings ought to be part of childhood learning environments (Moore & Cosco 2003, Young & Elliot 2013). In practice the latter follows North American, British and Australian[13] individuals and interest groups who have advocated remaking children's environments since the 1970s. These advocates challenge traditional conceptualisations of places for children as outdoor gymnasia (Heerwagen & Orians 2002, Kozlovski 2008), or what Evans (1987) calls monuments to misunderstanding, and their cumulative influence is evident in regulation number 113

[12] E.g. Baines & Blatchford 2011, Bateson 1972, Booker 2010, Boyle, Marshall & Robeson 2003, Broström 2005 & 2012, Bundy et al. 2009 & 2011, Burghardt 2011, Carse 1994, Challie & Tian 2005, Csikszentmihalyi 1975, Czałczyńska-Podolska 2014, Dias & Harris 1988, Elkind 2007, Evans & Pellegrini 1997, Ferholt 2007, Fisher et al. 2008 & 2010, Fleer 2010 & 2011, Fromel, Stelzer, Groffik & Ernest 2008, Groos 1919, Hall 1920, Hedges 2010, Hewes 2007, Holloway & Valentine 2000, Hughes 2010, Hyvonen & Kangas 2007, Kalliala 2006, Kalverboer 1977, Kieff & Casbergue 2000, Kozlovski 2008, Meckley 1994, Moyles 1989, Nath & Szücs 2014, Newton & Jenvey 2011, Nolan & Kilderry 2010, Parten 1932, Pellegrini 2005 & 2009, Pellegrini & Bjorklund 1996, 1997, Pellegrini & Huo 2011, Ridgers, Stratton, Fairclough & Twisk 2007, Scarlett, Naudeau, Salonius-Pasternak & Ponte 2005, Schulz & Bonawitz 2007, Smith 2005, Staempfli 2009, Stagnitti 2003, Sutton-Smith 1995 & 1997, Sylva 1977, Trageton 2007a, van der Kooij 2007, Vygotsky 1934/1978, Wood 2006, Zigler 2009.

[13] E.g. USA: Moore and Wong (1997); Natural Learning Initiative; Landscapes For Learning; &, The Nature Conservancy. UK: Allen (1968); Learning Through Landscapes; Royal Society for the Preservation of Birds; &, The National Trust. Australia: Evans (1987); Nature Play; Play Australia; & Planet Ark. See Johnson (2000) for an introduction.

of Australia's *Education and Care Services National Regulations* (Ministerial Council for Education, Early Childhood Development and Youth Affairs 2014) which now mandates access to 'natural' elements. At the same time there is no stipulation to remove existing traditional apparatus so the best interpretation available to this review is that current practice follows Wachs' (2006, p.305) advice that "the most useful strategy [in designing places for children] may be to provide a variety of environments in the hope that children can respond to different aspects".

Summation: nature views

Nature research and reviews present converging evidence, primarily from evolutionary developmental biology, which satisfactorily explains how child and/or adult: physical (e.g. Yang, Kelly & He 2007) and mental health (e.g. Domschke 2013); cognitive functioning (Geary & Bjorklund 2000, Lakoff 2012); and, perception (Gibson 1979) are influenced by genetic and epigenetic experiences[14]. This evidence informs contemporary references to child development in terms of age-related norms (e.g. Stagnitti 2003), advocacy for 'naturalised' schoolyards (e.g. Johnson 2007a) and research on predictors of intelligence (e.g. Rietveld et al. 2014) that are of interest to this study. Whilst *GfL* accepts the evidence supporting contemporary nature views this review also notes that nature explanations of learning are incomplete, environment may affect learning and development by other means (e.g. Sepanski Whipple, Evans, Barry & Maxwell 2010, Wachs 1990, 2000). Accordingly the following section discusses the known influence of nurture effects on learning and development.

Nurture views

Nurture views relating environmental conditions with individual characteristics have a long history in western discourses (Lugo 1994, Evans 1995, Moore & Golledge 1976, Wyman 2005). Lecas (2006), for example, traces Descartes's [1596-1650] mind – body dualism via Locke [1632–1704] and Berkeley's [1685–1753] view of "the organism at birth as a tabula rasa, which gained knowledge (ideas) through sensory experience" (Lecas 2006, p.389) to James [1773–1836] and John Stuart Mill [1806–1873] who explain the acquisition of knowledge in terms of "mental synthesis based on association mechanisms" (Lecas 2006, p.389). From this background, and on the basis of experimentally demonstrable relationships between environmental elements and individual responses, behavioural theories became the dominant discourse in human

[14] For an extensive discussion see Jablonka & Lamb 2005.

learning/development in the middle of the twentieth century (Mitchell & Ziegler 2007). This strongest nurture view suggests that stimuli situated "outside the organism, in its immediate environment and in its environmental history" (Skinner 1953, p.31) excite, inhibit, and reinforce associations (Shanks 2010) to assert that "control of the organism … [rests with] … the external environment" (Skinner 1953, p.49). A corollary of strong nurture positions is that learning and thinking are forms of behaviour (Overskeid 2008).

Strong nurture or behavioural views have been criticised since Kant (1781/1855) for ignoring innate capacities, self-awareness and cognitive constructs (Karpov 2005, Pellegrini et al. 2004, Richardson 1998, Shanks 2010). By the 1960s the accumulated effect of criticism was that many believed "the great behavioristic experiment carried through in the first half of the twentieth century [had] miscarried" (von Bertalanffy 1968, p.11). However, Bruner (1990) explains that the cognitive turn in psychological research did not reject nurture views per se but was effectively a movement to include phenomenological meaning in theorisations. Bronfenbrenner's (1979) early bioecological model of human development (Lugo 1994); recent connectionist and information-processing studies (Pinker 2004, Shanks 2010); and, emerging neuropsychological research suggesting that human cognitive systems are functionally connected to environmental conditions (Wilson 2010), also show contemporary psychology's continuing embrace of nurture views. Today the physical environment's potential to constrain, maintain or enhance human - environment relations is demonstrated by numerous credible reviews and studies[15] and Wachs (2006, p.293) is able to conclude:

> "that the question of whether the physical environment is relevant to children's development has been answered in the affirmative."

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[15] E.g.: Arndt 2012, Athman & Monroe 2004, Bingley & Milligan 2004, Bowler et al. 2007, Canning 2010, Christakis et al. 2007, Cornell et al. 2001, Czałczyńska-Podolska 2014, D'Amato & Cecchi 2008, Dijkstra, Pieterse & Pruyn 2006, Dyment 2009, Elton 1989, Faber Taylor, Wiley, Kuo & Sullivan 1998, Faber Taylor & Kuo 2008 & 2011, Ferguson et al. 2013, Fisman 2001, Fjørtoft 2004, Fjørtoft & Sageie 2000, Hinkley et al. 2008, Jackson 2003, Johnson 2007b, Kaplan 2001 a & b, Kellert 2005 & 2012, Kirkby 1989, Kuo, Bacaicoa & Sullivan 1998, Kuo & Sullivan, 2001, Laevers 2005, Legendre 1999, Lester, Jones & Russell 2011, Lieberman & Hoody1998, 2000 & 2005, Maxwell 2007, Mayer et al. 2009, McMichael 2001, Min & Lee 2006, Moore 1986c, Parrish 2005, Rickinson et al. 2004, Roberts et al. 2008, Russell & Ward 1982, Rutter 2002, Schoon et al. 2002, Sepanski et al. 2010, Sherman, McCuskey-Shepley & Varni 2005, Stephenson 2002, Stone & Faulkner 2014, Wachs 1990 & 2000, Waite 2011, Wells & Evans 2003, Woodruff et al. 2006.

Emerging evidence also allows Malafouris (2010, p.268) to posit that:

> "neuroscience can now confirm that … our minds and brains are (potentially) subject to constant change and alteration caused by our ordinary developmental engagement with cultural practices and the material world".

GfL's research examines children's learning in a naturalised schoolyard and draws on much contemporary evidence showing relations between environments, human health and cognitive functioning. Studies revealing correlations between environments and children's physical activity primarily focus on relations to obesity[16] but are relevant because findings that children are more active in diverse and naturalised spaces can be extrapolated to suggest activity as a plausible influence on learning. That is, if, as Schulz, Gopnik and Glymour (2007) and Schulz and Bonawitz (2007, p.1045) indicate, young children come to "understand causal relationships through active exploration of their environment" spaces that support increases in activity may do the same for learning.

A variety of studies that establish relations between environmental qualities and cognitive functioning[17] also have relevance for *GfL*. Hygge and Knez (2001) show that noise and heat affect teenagers' recall of text, for example, so draw attention to the possible role of schoolyard microclimates in children's cognition. Similarly, Barker et al. (2014) find that children who experience daily free time are likely to show higher levels of executive functioning. Other studies also show relations between environmental qualities and cognitive functioning[18] but of particular interest are those following from Ulrich's (1984) pioneering work with patients recovering from surgery. Ulrich's study reveals that viewing nature, as opposed to viewing an urban scene, speeds patient recovery and reduces both the need for painkillers and post-operative complications. Similarly, Wells (2000) reports that allowing seven to twelve year-old US children to access nearby nature improves cognitive functioning and Faber Taylor, Kuo and Sullivan (2001a) demonstrate that views of near-home nature are related to five to fourteen year-old girls' concentration and impulse inhibition. In related studies researchers from the same institution (Faber Taylor & Kuo 2011, Faber-Taylor et al.

[16] For example: Bundy, Tranter, Naughton, Wyver & Luckett 2009, Bundy et al. 2011, Engelen et al. 2013, Kingston, Van Vliet & Wridt 2007, Kriemler et al. 2011, Ridgers, Salmon, Parrish, Stanley & Okely 2012. For an introduction see Wyver et al. 2012a.
[17] For a review see Evans 2006.
[18] For a review see Wachs 2000. See also Dadvand et al. 2015.

2001b) link greener home surroundings with a reduction in the severity of children's ADHD symptoms and an Australian study reports that "green school grounds are positively associated with stronger capacity to pay attention ... [and] ... stronger performance in Maths, Spelling Reading and Writing" (Bagot, Allen & Kuo 2008, p.1). Although *GfL* does not specifically examine cognitive functioning this field of research does suggest the possibility that schoolyards may influence learning.

The presence of green nature has also been shown to influence children's activities, interpersonal relationships and meaning making[19]. In terms of relationships, Herrington and Studtmann's (1998) study of children attending Iowa State University's Child Development Laboratory School reveals that, when play structures/equipment are the primary source of activities, children who are "stronger, faster, and able to climb higher [become] leaders in the social strata" (Herrington & Studtmann 1998, p.203). Conversely the same research shows that when play structures/equipment are replaced with outdoor vegetative rooms command of language, creativity and inventiveness become the basis of the children's social hierarchy. Similarly, Tranter and Malone's (2004) Australian study also reports that, in forest-based activities, primary school children prioritise "co-operative rather than competitive play" (Tranter & Malone 2004 p.151). Others report associations between green areas and children's creativity. For example: Kernan and Devine (2010, p.378) indicate that "when given the opportunity to play outdoors ... children's agency and ingenuity came to the fore"; Aitken and Ginsberg (1988, p.73) find that "informal play areas tend to produce more creativity than their formal counterparts"; and, Samborski's (2010, p.100) Canadian study summaries the implications for *GfL* by reporting that a "biodiverse school ground provided many more affordances for play and discovery than the barren school ground."

Although reliable evidence indicates that environments influence humans, some nurture views are currently considered "anachronistic" (Silvia 2005, p.354). Outdoor gymnasia that mid-nineteenth century social reformers believed would 'save' children from the degradation of inner urban areas (Heerwagen & Orians 2002, Holloway & Valentine 2000, Lindstrand 2005, Moore & Wong 1997), for example, are criticised in the contemporary literature for attempting to use physical means to "control the mind and conscience" (Cavallo 1981 quoted in Gagen 2000, p.606). Although outmoded these views have left a "legacy of segregated playgrounds dominated by static

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[19] E.g.: Aarts 2010, Cheskey 2001, Ridgers, Knowles & Sayers 2012.

equipment" (Wake 2008, p.425) which continues "subordination of children" (Moore 2006, Sutton Smith 1997, p.125) to an adult hidden curriculum (Titman 1994).

Summation: nurture views

This study's review of the literature finds that many contemporary researchers rebut "environmental determinists [who] believe that there are specific connections between environmental characteristics ... and personality traits" (Moos 1973, p.653). Nevertheless, it is also clear that many studies identify plausible relations between environmental qualities and the human condition. For example: Aarts, Wendel-Vos, Van Oers, Van de Goor and Schuit (2010, p.214) are able to state that, in regards to children's play, "environmental characteristics can influence [the] activity behavior of large populations for a prolonged period of time"; and, Bairaktarova, Evangelou, Bagiati and Brophy (2011, p.214) explain that "developmental theory and empirical research firmly support the hypothesis that objects and their use by children constitute a universal part of development and learning."

Synopsis: mechanistic schools

Contemporary studies demonstrate that both biological and environmental elements influence human behaviour and learning so Kellert (2012, p.187) is able to summarise that:

> "Most of our physical, emotional and intellectual tendencies developed in adaptive response to mainly natural stimuli and conditions. Yet like much of what makes us human, for these tendencies to become fully functional, they must be nurtured and developed through adequate learning and experience."

By conceptualising human learning and development as a functional consequence of personal and evolutionary histories mechanistic schools draw practitioners' attention to the possibility that biological and environmental interventions potentially influence human developmental and learning outcomes (Perrin & Lee 2007). As such they raise many questions but of particular relevance for *GfL* is the forty year-old: "Do different environments ... reward or constrain different sorts of relationships ... and, if so, what are the ... outcomes of these relationships?" (Sonnenfeld 1972b, p.274). It is to questions of this type that *GfL* research ultimately turns but, before doing so, a qualitatively different conceptualisation of learning is discussed; one which emphasises that psychological states are critical factors in human motivation, perception and learning (e.g. Claxton 2008, Tuan 1974). These conceptualisations are discussed in the following overview of organismic schools.

2.2.2 Organismic schools

The work of Immanuel Kant (1781/1855) bridges the nature - nurture dichotomy and establishes an organismic orientation to learning and development (Moore & Golledge 1976), the key ontological feature of which is an insistence that people direct their own learning (Lugo 1994). Cook and Cook (2009) itemise organismic views as (i) psychoanalytic, (ii) cognitive and (iii) contextual-systems, so the following section briefly reviews these.

Psychoanalytic views

At the beginning of the twenty-first century classical psychoanalytic theories that centre on conflict-laden sexual anxieties have “fallen into both academic and popular disfavour” (Kandel 1999, Mayes 2009, p.540). Views with roots in psychoanalysis retain credibility, however, and humanism, an offshoot of psychoanalytic theory, is “integrated within the culture” (Aanstoos 2003, p.122).

Humanistic psychology positions individual self-actualisation as the pre-eminent motive in human activity (Maslow 1966) but differs from classical psychoanalytic theories by insisting on a fundamental “integrated wholeness” (Maslow 1943, p.371). Thus, the view presents an image of the whole child that is “founded on the values of respect, social responsibility, self-actualization, justice, and freedom” (Challie & Tian 2005, p.98). Humanism embraces a range of approaches that anticipate self-understanding as an emergent, relational phenomenon (Aanstoos 2003, Elkins 2009, Pinar & Reynolds 1992). It accepts, for example, that people can be biologically motivated (Maslow 1943) but, in *GfL*'s view, would re-interpret Wilson’s (1984) concept of biophilia, not as a functional consequence of evolutionary history, but in terms of people self-actualising "through a sense of belonging or connectedness to the natural world” (Mayer et al. 2009, p.635). Similarly, humanism might re-interpret the biological imperatives that some posit for children's playful activities in terms of activities that allow children experiences of control that reduce "fear of the external world" (Ferholt 2007, p.72).

Humanism influences contemporary research through concerns with experience (Smith 1994) and has two key implications for this study. First, accepting that experience might influence learning suggests that *GfL* use a "methodology … capable of studying human experience without reducing it to presupposed mechanistic elements" (Aanstoos 2003, p.123). Second, by drawing attention to the meanings of activities, places and artefacts, humanistic views compel an expanded conceptualisation of learning which Claxton (2008, p.183) foreshadows in *Cultivating Positive Learning Dispositions*. He writes:

> "Often the word 'learning', when it is used, is taken to be co-extensive with ... thinking. However, it is clear from the scientific literature ... that learning involves far more than rational cognition ..."

Just as humanistic views expand understandings of learning they also require that studies attend to the ecology of learning. As Paradise and Rogoff (2007, p.105) explain, researchers must appreciate that:

> "the acts, attitudes, and orientations of learning, as well as the social and physical contexts in which it takes place, are interdependently related aspects, not a collection of separate and separable behaviours or factors."

Classical psychoanalytic views are no longer part of the contemporary literature but derivatives, which focus attention to personal experience and meaning making, remain relevant for a variety of disciplines. For example, humanism, with its particular emphasis on holism and experience, enlarges the ecology of children's learning to the post-structuralist relationalism that is addressed in this study's methodology, findings and discussion.

Cognitive views

Cognitive views seek to overcome perceived weaknesses in mechanistic explanations of learning and development by espousing the use of scientific methods to investigate human information processing and thinking in the manner pioneered by Ebbinghaus [1850-1909] (Balota & Cortese 2000, Richardson 1998, Roediger & Meade 2000, Solso & MacLin 2000). In contrast to strong mechanistic positions, cognitive views take the view that thinking and learning are psychological processes that "draw from the stories of the mind" (Piaget 1924, p.10) in order to make sense of experiences and information (Caws 2007, Gutierrez 2008, Hord 2009, Liu & Matthews 2005, Lugo 1994).

Piaget [1896-1980] is considered the leading figure of twentieth century cognitivism (von Glaserfeld 1990) and the "father of modern constructivism" (Elkind 2005, p.332), cognitive psychology's favoured learning theory (Gergen 1985, Liu & Matthews 2005). Piaget's (1924, 1930, 1952, 1962, 1970, Piaget & Garcia 1983/1989, Piaget & Inhelder 1969, Inhelder & Piaget 1958) influential work describes learning in terms of biologically prepared persons actively seeking a level of cognitive equilibrium through the dual processes of (i) assimilating externalities into existing mental schemas and (ii) adapting schemas to accommodate new information (Fleer 2011, Inhelder & Piaget 1958, Lam 2008, Piaget 1970). As such, constructivism recognises both individual agency and the contextual nature of experience and learning (Morris 1997, Plumert 2008). This Piagetian dualism is apparent in both decades-old and current literature that attempts to "combine elements from both ... determinist ... [and] voluntarist philosophies" (Johnston 2014, p.8). For example, cognitive views clearly inform structuration theory's conceptualisation of schemas and resources which both inform the "constitution of meaning" (e.g. Giddens 1984, p.18, Lakoff 2012, Ross 1994) and "constrain and enable individual action" (Aitken 1992, p.555). Strong cognitive schools focus on "mental constructs indifferent to action, social construction, and symbolic mediation" (Neuman & Nave 2010, p.43) however, and posit that "reality is experienced indirectly through internal ... replicas of an external world" (Spackman & Yanchar 2013, pp.9-10). As such "cognition is ... an operationally closed process" (Kraus 2014, p.2). In addition strong cognitive schools describe relatively fixed, qualitatively different stages of mental ability (Fleer 2011, Mitchell & Ziegler 2007, Pellegrini 1987, Piaget & Garcia 1983/1989, Piaget & Inhelder 1969) but these are disputed (e.g. Fodor 2001, Gagen 2000, Giddens 1984, Whalen 1995). For example, Brainerd (1993) suggests that the presumed developmental sequence may, in fact, be a measurement sequence. The legitimacy of strong cognitive views, which once held a near monopoly on theories of human learning, is weaker than it once was (Overskeid 2008) however, and contemporary neuroscience states:

> "the old idea that cognition uses the abstract manipulation of disembodied symbols that are meaningless in themselves but that somehow constitute internal 'representations of external reality' ... [was] left behind more than three decades ago" (Lakoff 2012, p.773).

Contemporary Piagetian views acknowledge criticisms of strong cognitivism and suggest that experience-dependent stages of development are less distinct than Piaget suggested (Sigelman & Rider 2014). More importantly Piagetian cognitivism no longer constructs the human mind as a repository of mental representations[20] but interprets it as a decoder of emplaced knowing (Robbins 2007). Nolan and Kilderry (2010, p.109) can therefore state that:

> "researchers and practitioners have begun to question the normative assumptions which developmental theories have traditionally promoted about children's development, learning and play".

Today, existing and emerging brain-imaging research demonstrates links between life experiences and mental structures (Sigelman & Rider 2012) but sufficient evidence already enables Laevers (2005, p.1) to confidently state that cognitive systems:

> "regulate the way we process incoming stimuli and construct reality ... [and] determine which and how many dimensions of reality can be articulated in ones perception and cognition."

Contemporary cognitive schools follow a Piagetian dualism by both positing experience of the environment as an influence on psychological processes and positioning learners as active agents-in–context (Wapner 2000). As agents, children therefore create their own experiences and "impose structure on the information available from experience" (Bransford, Brown & Cocking 2000, p.113). Consequently, Schön (1983, p.280) can state that "doing and thinking are complementary ... each feeds the other, and each sets boundaries for the other". *GfL*'s interpretation of contemporary cognitive views has three implications. First, studies identifying age-related changes in human behaviour, place understandings and thinking (e.g. Hazen 1982, Kalish, Weissman & Bernstein 2000, Legrende 1999, Malinowski & Thurber 1996, Pellegrini 2005, Thurber 1995, van der Kooij 2007) are conceptualised as indicators of possibility rather than examples of presumed norms. Second, in accepting that environments can support qualitatively different, "non-additive" (Stetsenko 2009, p.126) levels of learning this study admits Piaget's (1962) view that assimilation, which dominates during play episodes, is "a rehearsal of old learning" (Ferholt 2007 p.50) not learning per se. Last,

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[20] Systems views account for learning without resorting to "detailed internal representations of the external environment" (Mossio & Taraborelli 2008, p.1326).

since children’s cognition is at least partly "the result of individuals’ actions on objects” (Pellegrini & Huo 2011, p.237), *GfL*'s focus on proximal processes relations to children's actions on objects ought to take a systems view.

Systems views

Although various views on learning maintain points of difference, the contemporary literature broadly accepts systems views that integrate “the fundamental aspects of a wide variety of theories” (van Geert 1998, p.635). In so doing systems views posit a “fluid process of mutual influence between individuals in relationships and between individuals and their environmental contexts” (Doherty 2000, p.536) such that nature and nurture, cognition and meaning "are not ignored; rather, they are understood to remain indeterminate in their effects until they are absorbed by the evolving [system] activities” (Fleer, Hedegaard & Tudge 2009 p.131). Giving attention to indeterminate effects means that systems views:

> “focus on the interface between people and environments ... they do not focus on either the person (e.g., perception, cognition, personality) or the environment (e.g., behaviour setting) side of a person-in-environment whole. There are no separate actors or events” (Aitken 1992, p.557).

Earlier *GfL* discussed Piagetian constructivism as a widely accepted account that relates proximal processes to learning. For Piaget development is an internal process however, so, although Piaget’s and Vygotsky’s (1934/1978 & 2004) theories are "complementary and mutually supportive" (Miller 2011, p.ix, Tudge & Winterhoff 1993), the latter's work is deemed to offer a more complete synthesis of nature, nurture and organismic views (Bowler, Annan & Mentis 2007, Reed 1993). Primarily this is because Piaget relies on biological maturation to account for the development of conceptual learning whereas Vygotsky discusses how contexts scaffold construction of higher-level concepts. Vygotsky proposes that:

> "a vital transitional stage toward operating with meanings occurs when a child first acts with meanings as with objects (as when he acts with the stick as though it were a horse)" (Vygotsky 1934/1978, pp.99)

Additionally, Vygotsky suggests that *mediation* "for and in … activity” (Wells 1999, p.123) scaffolds different stages of learning. Expanding on mediation as a process of learning Miller (2003, p.11, emphasis in the original) writes that:

> "All forms of mediation, or instruction, or *other*-regulation, consist of doings that are experienced as happenings. ... The effect of mediation, then, is to reduce an agent to an actor whose actions are now experienced as happenings by the *self*."

In Vygotsky's (1934/1978) original description mediation is purely a semiotic process but neo-Vygotskians (e.g. Cole 2005a, Leontiev 1978, Rogoff 1998, Stetsenko & Arievitch 2002, Vianna & Stetsenko 2006) propose a cultural-historical view of learning that also attributes mediational properties to signs, symbols and artefacts. Such an attribution is consistent with Ceci, Bronfenbrenner and Barker (1988, p.24) and others (e.g. Bohm 1992, Capra 2005, Hawkins 2014, Lakoff 2012, Wartofsky 1979, Wilson 2010) who suggest that "the context in which cognition takes place is not simply an adjunct to cognition but the constituent of it." The roles contexts play in proximal processes and learning are discussed in the next section of this chapter but here *GfL* indicates that the neo-Vygotskian view of contexts, perception and learning as components of a system is consistent with contemporary neuropsychological research showing that the human brain both changes as result of experience (Blaesi & Wilson 2010, Pascual-Leone 2005) and has "ability to draw *implicit* 'theoretical' and conceptual *inferences* regarding the background assumptions encoded in the action of others ... [as] a routine operation" (Lizardo 2007, p.335, emphasis in the original). Such research allows Malafouris (2010) to suggest that:

> "Although material culture is recognized as a 'causal influence' it is rarely seen as playing a 'constitutive' role ... [nevertheless] the human brain is a dynamic construct remodelled in detail by behaviourally important experiences which are mediated, and often constituted, by the use of material objects and cultural artefacts" (Malafouris 2010, pp.265-266).

GfL acknowledges that Malafouris's (2010) systems view is at the leading edge of opinion and also that Rose (2001, p.62) reminds us "we are in the uneasy position of living with several conflicting worldviews." As such, this review recognises that strong systems views, such as Actor-Network Theory which suggests that agency is distributed to non-humans (Bingham 2009, Clarke 2002, Johannesson & Bærenholdt 2009, Thrift 1999), are criticised because:

> "a) concepts are so abstract and broad as to be not testable:
> b) it tends to neglect the role of individual psychological factors because of its

emphasis on interactional processes and contextual dynamics: and,

c) it tends to neglect the contextual issues ... in its pursuit of broad explanatory models" (Doherty 2000, p.537).

Whilst systems views and their critics have implications for *GfL*'s research design this study does not join the ongoing dialogue that theorises systems (e.g. Gabora, Rosch & Aerts 2008, Jablonka 2002), instead this *GfL* wonders how a synthesis of mechanistic and organismic perspectives may be related to research about learning. The next section therefore introduces three existing theories that are pertinent to this question and, in so doing, it develops a dimension of the contemporary literature that is under-theorised.

Developing a new synthesis

Bronfenbrenner and Morris's (2006) bioecological model proposes that reciprocal interactions between individuals and environments are the engines of development and today numerous studies and reviews discern how environments may influence human health, learning and development. The Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment (2004, p.72) report *Nature and Health* suggests, for example, that it is:

> "plausible that children's cognitive and emotional development benefits from varied, regular and direct contact with trusted natural environments. However, the theoretical discussions, together with the evidence ... are not yet convincing."

Similarly *A Review of Research on Outdoor Learning* (Rickinson et al. 2004, p.8) concludes that the processes by which contexts influence learning are "a significant blind spot" in the literature. More recently Blackmore, Bateman, Loughlin, O'Mara and George's (2011) *Research Into The Connection Between Built Learning Spaces and Student Outcomes* posits that contexts influence learning via social processes[21] and Martin's (2011, p.9) *Putting Nature back into Nurture: The benefits of nature for children* adds "learning opportunities [and] diverse features and items" as potentially influential factors. However, as in earlier examples, these later reviews do not discuss

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[21] A well-developed literature discusses processes of learning by social exchange (see Bandura 1977, 1986 & 1989) but these are not a focus for *GfL*. However, a concern for this study is that Blackmore et al. (2011) and others use the term *mediation* in relation to social processes but that, as Miller (2013) points out, the use sometimes presents mediation as an essentially associative process - a representation that is at odds with Vygotsky's description. To avoid confusion *GfL* uses the term 'mediation' as Miller suggests and 'exchange' to describe associative and transactional processes.

how material contexts constitute learning processes.

Beginning from the systems view that learning is a situated, psychologically constructive process (de Kock et al. 2004) that may be multi-level (Piaget 1952, Vygotsky 1934/1978) *GfL* proposes that a new synthesis of ecological psychology (J. J. Gibson 1979 & E. J. Gibson 1992), neo-Vygotskian theory, and Bateson's (1972) thinking about double binds offers a theoretical basis from which to research context's constitutive role in learning processes.

Gibson's (1979) ecological psychology shares Bronfenbrenner's whole-systems view (Tudge, Gray & Hogan 1996) in that "the person-environment relationship is immediate and based on practical activity rather than on being analytical" (Kyttä 2004, p.28). Ecological psychology emphasises perception as "a keeping-in-touch with the world, an experience of things rather than a having of experiences" (Gibson 1979, p.239) however, so differs from Bronfenbrenner in positing that "the 'values' and 'meaning' of [some] things in the environment can be directly perceived" (Gibson 1979, p.127). In conventional usage perception, or the evolved capacity to see, hear, or become aware of objects and phenomena directly through the senses, explains learning as an associative process; a process whereby individuals perceive objects or phenomena as stimuli and associate these with responses. Associative learning is therefore cumulative and requires continuing access to an increasing store of memories. Perceptual learning as described in ecological psychology, on the other hand, is a process of discerning and differentiating responses to variables (Gibson & Gibson 1955). Ecological psychology is careful to note that perception does not discern "the qualities" (Gibson 1979, p.134) of materials, objects, places or phenomena however; what an observer perceives are *affordances*[22] or the "physical opportunities and dangers which the organism perceives while acting in a specific setting" (Kyttä 2004, p.181). In this view perception, as discernment of affordances, "is first and foremost a process of selection" (Gibson 1992, p.217) and perceptual learning is not associative since it derives from the control afforded by more accurate perception (Adolph & Kretch, in press).

The literature points to two key outcomes of perception-related learning; recognising what something looks like and what may occur in terms of physical

[22] See section 2.2.1 for further discussion of affordances.

interaction (Neisser 1987). Neither associative nor perceptual processes adequately explain how other-level learning emerges from existing contexts however (Daniels 2008). For *GfL*, Gibson's (1979, p.253) observation that "a special sense impression clearly ceases when the sensory excitation ends ... [but] a perception does not" nevertheless opens the possibility that perception may be a basis for other-level learning. Explaining Gibson's view Robbins (2007, pp.14-15) writes that perception is best:

> "treated in terms of a melody, the notes (states) of which permeate and interpenetrate each other, the current note being a reflection of the previous notes of the series, all forming an organic continuity, a succession without distinction."

It follows from Robbins's description that environmental information is perceived both directly and, simultaneously, as a flow of sensory input. Perception thus provides reliable information about both (i) invariants, or non-changes that persists during change (Gibson 1966), and (ii) "dynamic regularities" (Mossio & Taraborelli 2008) that occur in "the experience of things" (Gibson 1979, p.239). Evidence that individuals become aware of dynamic regularities is well established in the experimental literature (e.g. Chance 2013, Hulse, Fowler & Hoenig 1978, Lorenz 1996, Schultz 2002) and discussed variously as "learning to learn" (Harlow 1949, p.51) or sensitivity to: an implicate order (Bohm 1980), contingencies (Braine 1990), landscape (Foucault 1994), background (Shotter 2012) or hidden curriculum (Titman 1994).

On the basis that children may perceive what Robbins (2007) terms melody *GfL* posits that perception may afford more than one type of learning. For example, the novel use of objects that consistently attracts the attention of juvenile primates (Pellegrini 2009) may afford both the primary benefit of breaking open a nut (as well as learning *what* may be done with a nut and stone) and, if one becomes aware that the novel use of objects attracts the interest of other juveniles, a secondary benefit of garnering peer attention (as well as learning *how* to garner peer attention). Accordingly, *GfL* extends contemporary interpretations of perceptual learning by coupling Gibson's (1979, p.239) concept of perception as an "experience of things rather than a having of experiences" with Miller's account of mediation as a process whereby the self becomes an "actor whose actions are now experienced as happenings" (2003, p.11). In *GfL*'s view this conjoining of Gibsonian and neo-Vygotskian theory opens the possibility that perception may differentiate not only categories but also levels of affordance. For example, it invites consideration of the mediating effect on learning of children perceiving meaning-laden objects or phenomena such as that shown in Image 2.

Image 2. Children sit in a rectangle made by arranging three sticks and a log. Here the physical form of the artefact embodies the children's concept of enclosure. (Source: Deepwater, Week 4, Term 3, 2013[23].)

In this example four children sit in an approximately rectangular arrangement of three sticks and a log. An experienced observer may recognise the arrangement as an enclosure but novices are likely to have a different experience. To paraphrase Gibson (1979) and Miller (2003), perceiving the artefact may temporarily reduce a novice from an agent to an actor for whom knowledge of enclosure is experienced as being inside or outside the rectangle. That is, because the concepts involved in producing an artefact are available as a subject of perception the novice may experience a "transitional stage [of] operating with meanings ... as with objects" (Vygotsky 1934/1978, pp.99). Thus, whilst a primary affordance of perception may be using sticks (and so learning what may be done with sticks), a secondary affordance of perception may be mediation of a meaning/concept. Additionally, *GfL* posits that, if working with concepts/meanings becomes a dynamic regularity in the flow of children's schoolyard activity, processes of perception and mediation will sensitise novice observers to the possibility that material and social phenomena are imbued with meanings/concepts. In other words, *GfL* conceptualises the possibility that Gibsonian and neo-Vygotskian processes account for

[23] Earlier references to school newsletters specify dates. The change here reflects Deepwater's changed nomenclature.

children learning both *what* may and may not be done in their schoolyard and *how* phenomena may represent meanings/concepts. This argument is similar to that developed in Bateson's (1972) *Steps to an Ecology of Mind*. In this Bateson follows Harlow (1949) to suggest that second-order learning contextualises first order learning - a process both refer to as 'learning to learn'. Bateson then posits that third order, or generative learning is also possible once first and second-order learning are in place. In this he identifies double binds as the source of learning that expands awareness of system properties. Bateson suggests that third-order generative learning[24] arises when:

1. Two or more persons are involved in a high value relationship;
2. Messages are regularly given that, at one level, assert something but which, at another level, negate or conflict with the assertion;
3. The receiver of the incongruent messages cannot withdraw from the situation; and,
4. The incongruency tends toward self-perpetuation (adapted from Visser 2003, p.273).

More recent work by Engeström (1999, 2001, 2007 p.8) supports Bateson's view and indicates that "qualitative stages and forms of activity emerge as solutions to ... [double bind] contradictions." Bateson is clear that double binds originate in social contexts but, on the basis of Gibsonian and neo-Vygotskian theory suggesting that people may be capable of reading the meanings imbued in phenomena, *GfL* posits that schoolyard materiality may be a source of incongruent messages that provoke double binds. In practice this study's research therefore looks for instances where children perceive a poor fit of affordance actualisations and emplaced meanings that lead to examples of consequent adaptations that expand individual participation in system practices.

2.2.3 Synopsis: proximal processes

Contemporary systems views integrate the long-standing nature-nurture dichotomy by showing that both biological and environmental factors influence learning and development. Significantly, systems views also embrace Immanuel Kant's (1781/1855) observation that humans are active agents in their own learning and therefore adding psychological layers to nature-nurture processes that influence

[24] Henceforth this study references Wartofsky's (1979) use of the epithet 'tertiary' to signify third-level learning. For consistency first-order learning is referred to as primary learning and second-order learning is referred to as secondary learning. In due course the nomenclature is also adopted for primary, secondary and tertiary affordances.

learning. These views emphasise that learning is a process that self-organises "in response to information specifying the task and to the physical environment" (Thelen 1992, cited in Miller & Coyle 1999, p.226). Contemporary researchers and theorists who conceptualise learning as an emergent, relational property therefore give attention to the “decisive, animating role [of environments] in our collective lives” (Casey 1993, p.31). Whilst the environment's capacity to animate learning and development is widely recognised, the contemporary literature has only recently begun to examine how material influences may constitute learning. Furthermore the formative role school contexts may play in learning processes is not addressed in current research. To address this blind spot and progress its research *GfL* proposes a synthesis of Gibsonian, neo-Vygotskian and Batesonian theory. However, although these systems views are well regarded, the necessity to make a “critical distinction[s] … between the concepts of environment and process” (Bronfenbrenner & Morris 2006, p.996) remains. The following section therefore reviews key aspects of environment (methodological implications are discussed in the next chapter of this thesis). The section also serves to extend *GfL*'s exposition of context - the second factor highlighted in Bronfenbrenner and Morris's (2006) bioecological model.

2.3 Context: ecology of childhood

Although the contemporary literature embraces evidence that the "contexts of everyday life ... significantly shape and constrain our experiences" (Eyles 1989 p.104) defining context can be problematic (Lunt 1994, Sonnenfeld 1972a). In simple terms context may be understood as the total environment, one’s surroundings, a space or a place but different interpretations of these phenomena highlight tensions between understandings of form and function that have existed since ancient times (Capra 2010). Trageton (2007b) indicates that space, for example, can be understood as either a topological or Euclidian phenomena. Euclidian views follow from Plato [428/427 BC - 348/347 BC] and envision space as static, homogenous, quantitative, measurable, abstract, and infinite. Conversely, topological conceptualisations follow Aristotle [384-322 BC] and envision space as dynamic, heterogeneous, qualitative and immeasurable. Though ancient, different conceptualisations continue into the modern era; Engels (1886/1934, p.54), for example, contends that "the world is not to be comprehended as a complex of ready-made things, but as a complex of processes”; Henderson (2009, p.540) reports that "recently, geographers and others have taken up the question of whether globalization has eliminated place as a social-spatial reality"; and, Marston, Jones and Woodward (2005) suggest eliminating scale from human geography in favour of relationship. Other poststructuralists also favour relational views and some even suggest that the environment may participate in humanity (Conley 1997); educators Fleer, Hedegaard and Tudge (2009, p.131 emphasis in the original) write, for example, that:

> "the environment is not something outside the child that can be added to the child's own 'internal' characteristics; rather, the child is included, right from the start, in the *ongoing process of relationships with one's environment* … that constitute the form of life … for the child."

Similarly places, which may be defined in terms of a particular location (Lutts 1985) at a particular time (Conradson 2005), might also be something akin to:

> "ongoing accomplishments produced through transactions and relations that cross their borders. These borders, in turn, are contingent outcomes of definitional strategies and struggles that produce places in different forms at varying scales" (Nespor 2008, p.475).

Clearly, definitions of context, environment, space and place are contested but a variety of disciplines agree that it is useful to describe contexts in terms of recursive, multi-layered, multi-scale relationships (e.g. Christensen, James & Jenks 2000, Holloway & Valentine 2000, James, Jenks & Prout 1998, Johannesson & Bærenholdt 2009, Morris 1997, Rose 2001, Sewell 1992, Wachs 2000). Contemporary human geography and social science, for example, interpret environment, space and place in terms of systems (Johnston & Sidaway 2004). Whilst ongoing arguments continue to explore the value of differentiating scales of influence (e.g. Leitner & Miller 2006) *GfL* recognises that the concept of scale is implicit in the bioecological model, human geography (e.g. Gregory 2009, p.709) and educational theory (e.g. Stetsenko & Arievitch 2002). This is evident, for example, when psychologists Kaplan, Kaplan and Ryan (1998, p.15) maintain a distinction between proximal and distal contexts by indicating that "without experience of place, [space's] unique features are difficult to recognize". Similarly, others who discuss learning also identify scale as a significant element; van Oers (1998, p.481) suggests that "what counts as a context depends on how a situation is interpreted in terms of activity to be carried out" and Maxwell (2007, p.231) writes that "a private space adjacent to a popular activity ... does not provide a child with the opportunity to be alone". In the former van Oers's scale is the 'activity' and in the latter Maxwell's 'aloneness' becomes the scale by which contextualised functionality is described. It is not *GfL*'s purpose to elaborate rhetorics that argue the relevance of scale however, rather, having acknowledged they exist, this study takes the bioecological model's four nested contexts as its starting point (see Figure 3). The following section therefore expands on contexts as they relate to the proximal process of learning and, for consistency, the expansion is presented according to the bioecological model's microsystem, mesosystem, exosystem and macrosystem contexts. Additionally, following Wachs's (2000) inclusion of meta-level influences in the bio-ecological model, two contemporary rhetorics relating learning and activity in the environment are also discussed.

2.3.1 Microsystem influences

The defining characteristic of microsystems is that their elements can be perceived and, importantly for this study, responded to or acted upon. Early versions of the bioecological model omit the outdoor environments as an influence on humans and explain microsystems as patterns:

> "of activities, social roles, and interpersonal relations experienced by the developing person in a given face-to-face setting with particular physical, social, and symbolic features" (Bronfenbrenner 1994, p.39).

By the above definition schoolchildren's microsystems include “parenting customs, sibling and peer relations” (Iarocci, Yager & Elfers 2007, p.4), the psychology of caregivers (Wachs 2006) and “the kind of teaching and the way the teaching is provided” (Kyttä 2003, p.24). Contemporary research[25] demonstrates that physical elements affect human behaviour and dispositions however, and later iterations of the bioecological model are adapted accordingly (Moore 1986a). Microsystem elements that are of particular relevance for *GfL* include research and reviews[26] which

[25] E.g.: Aarts, Wendel-Vos, Van Oers, Van de Goor & Schuit 2010, Arndt 2012, D'Amato & Cecchi 2008, Dijkstra, Pieterse & Pruyn 2006, Hillman, Erickson & Kramer 2008, Hinkley et al. 2008, Jackson 2003, Kaplan 2001a, Kellert 2005 & 2012, Laumann, Garling & Stormark 2003, Mayer et al. 2009, McMichael 2001, Russell & Ward 1982, Rutter 2002, Schoon et al. 2002, Sherman, McCuskey-Shepley & Varni 2005, Ulrich 1984, Wachs 1990, 2000 & 2006, Waite 2011, Woodruff et al. 2006.

[26] E.g.: Athman & Monroe 2004, Bell & Dyment 2008, Canning 2010, Challie & Tian 2005, Chawla, Keena, Pevec & Stanley 2014, Cheskey 2001, Colladoa, Staatsb &

demonstrate that material influences “constitute a universal part of development and learning” (Bairaktarova, Evangelou, Bagiati & Brophy 2011, p.214). For example, a pilot study by Christakis, Zimmerman & Garrison (2007) shows that, in a sample of children from middle and low-income families, manipulating blocks is associated with significantly higher language scores. Other studies show that material contexts influence groups of children. For example, Bagot, Allen and Kuo's (2008) Australian study associates green school grounds with improved academic outcomes and a study of two and a half thousand Spanish schoolchildren (Dadvand et al. 2015) relates greenness with improved working memory. Green environments are also linked with changes in social interaction. For example, Herrington and Studtmann’s (1998) study of young children attending Iowa State University’s Child Development Laboratory School reveals that when play structures/equipment are the primary source of activities children's social strata are dominated by those who are "stronger, faster, and able to climb higher" (Herrington & Studtmann 1998, p.203). The same researchers show that when play structures/equipment are replaced with outdoor vegetative rooms command of language, creativity and inventiveness become the basis of the children’s social hierarchy. Similarly, though originating on another continent, Tranter and Malone's (2004) Australian study reports that primary-school children prioritise “co-operative rather than competitive play” (Tranter & Malone 2004 p.151) when engaged in forest-based activities. The volume and quality of research associating experience of proximal environments with learning-related phenomena provides Wachs (2006) and this review with convincing evidence that materiality forms part of children's microsystems.

Affordances

Not all materiality is relevant to learning; Bronfenbrenner (1979, p.4) posits that

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Corraliza 2013, Cornell et al. 2001, Czałczyńska-Podolska 2014, Dadvand et al. 2015, Dyment 2009, Elton 1989, Engelen et al. 2013, Evans 2001, Faber Taylor, Wiley, Kuo & Sullivan 1998, Faber Taylor & Kuo 2008 & 2011, Ferguson, Cassells, MacAllister & Evans 2013, Fisman 2001, Fjørtoft 2004, Fjørtoft & Sageie 2000, Fleer 2010, Hart 1979, Heft 1988, Johnson 2007a, Kernan 2010, Kirkby 1989, Korpela Kyttä & Hartig 2002, Kriemler et al. 2011, Kuo, Bacaicoa & Sullivan 1998, Kuo & Sullivan, 2001, Kyttä 2002, 2003 & 2004, Laevers 2005, Legendre 1999, Lester, Jones & Russell 2011, Lieberman & Hoody 1998, 2000 & 2005, Lindstrand 2005, Lucas & Dyment 2010, Malone & Tranter 2003a, Maxwell 2007, Moore 1986c, Nath & Szücs 2014, Parrish 2005, Parsons 2011, Pellegrini & Huo 2011, Prescott 1987, Rickinson et al. 2004, Ridgers, Knowles & Sayers 2012, Roberts et al. 2008, Samborski 2010, Sepanski et al. 2010, Spencer & Woolley 2000, Stephenson 2002, Stone & Faulkner 2014, Trageton 2007a, Tranter & Malone 2004, Vosniadou, Skopeliti & Ikospentaki 2005, Wells 2000, Wells & Evans 2003.

“what matters [for children's learning] is the environment as it is perceived rather than as it may exist in objective reality” so the question of what people perceive is central. In his *The Ecological Approach to Visual Perception,* Gibson (1979) explains that humans do not perceive a context's material qualities but its affordances. Regarding the latter he writes:

> "The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, but the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment" (Gibson 1979, p.119).

Later Gibson (1979, p.157) again makes the point that affordances are relative to an individual; he writes:

> “A cliff is a drop-off that is large relative to the size of the animal, and a step is a drop-off that is small relative to its size. A falling-off edge is dangerous, but a stepping-down edge is not.” [27]

Based on Gibson's (1979) description ecological psychology consistently maintains the relativity of affordances whilst eschewing explanations of affordance-perception that rely on memory[28] (Kytta 2003). For ecological psychology (and *GfL*) perception is (i) direct, (ii) more differentiated with experience and (iii) not reliant on mental representations (Gibson 1992). There is, within ecological psychology, ongoing debate regarding a precise definition of affordances however (Walsh 2014); the principal difference turning on where affordances are located. For example, Woolner, McCarter, Wall and Higgins (2011, p.48) define affordances as: “latent in the environment ... but always in relation to the actor and therefore dependent on their capabilities”. Chemero (2003) suggests, however, that the affordances are located in the relationship between an individual and a feature, neither in the feature nor in the agent. Others point out that factors beyond both the individual and a feature affect affordances; they argue that a

[27] A corollary of Gibson's theory is that humans, who share similar perceptual and physical capacities, generally perceive affordances similarly (Lapedes 1978).

[28] Designer Norman's (1988, p.14) suggestion that humans apply “past knowledge … to our perception” to perception has proven confusing for some however (Nye & Silverman 2012).

whole-systems view is necessary (Stoffregen 2003). Whole-systems views account for empirical evidence demonstrating that, in conjunction with material and personal properties, the presence of other people also influences perceptions of affordances. For example, the well-established Hawthorne Effect (Mayo 1933) and Legrande's (1999) observations that children actualise affordances differently in the presence of peers are explained by affordances being influenced by material, personal *and* social conditions. Additionally, systems views of affordances also accommodate suggestions that intangible meanings and concepts influence perceptions and actualisations of affordances. In this regard Gibson (1966, p.285) writes that "the human observer learns to detect what have been called the values or meanings of things" and Robbins (2007, p.328) suggests this implies that meanings themselves may be "an affordance within the medium of the environmental field". Such views have significant implications for research into relational affordances for learning. For example, an individual encountering the situation shown in Image 2 may perceive a relationship with sticks and, if so, he or she may learn *what* can be done with sticks. However, if the rectangular arrangement is perceived as part of a larger system with the meaning 'enclosure' the observer's relationship is likely to afford activity and learning that far exceeds perception of three meaningless sticks and a log - the observer is likely to learn and actualise *how* to participate in the perceived context. In short, the systems view advocated by Stoffregen (2003) and adopted by *GfL* allows that affordances may be actual and abstract.

In the existing literature Wartofsky's (1979) *Models: Representation and Scientific Understanding* offers a theoretical discussion of how actual and abstract affordances may be conceptualised. According to Wartofsky, human activities transform material objects into three types of artefact, viz:

- Primary artefacts, or tools, facilitate *what* can be done in context. Sticks, for example, are primary artefacts that influence *what* forms or structures children in this study might make in their schoolyard.

- Secondary artefacts, or categories of signs or symbols, that communicate *how* to participate in a culture. For children in this study building cubby houses may normalise the boundaries and relationships between individuals or groups, for example, and so, in neo-Vygotskian terms, mediate how to participate in the schoolyard microsystem.

- Tertiary artefacts, or "embodiments ... symbolic externalizations or objectifications ... according to some convention" (Wartofsky 1979, p.201, emphasis in the original), that are representations of the ideality that shaped them[29] (Cole 2005a). Buildings, school grounds and other cultural artefacts, for example, are the physical expressions of the schemas that inform their design (Kozlovski 2008) and so are interpreted as tertiary artefacts.

Previously *GfL* introduced Bateson's (1972) orders of learning to conceptualise the different-level learning-related effects of proximal processes. Now *GfL* suggests that fusing Wartofsky's conceptualisation of artefacts and Bateson's ecology of learning offers a new insight into how children's schoolyard activities may afford multi-level learning. First, at the primary level, perception and actualisation of phenomena affords learning *what* may or may not be done with the phenomena. Second, at the secondary level, perceiving the meanings and concepts embedded in phenomena affords (via mediation) *how* individuals and groups understand participation in primary and secondary affordance actualisations. Third, given that material microsystem elements may embed primary, secondary and tertiary concepts, *GfL* suggests that contradictory messages within and/or across levels may provoke double binds and, in resolving perceived contradictions, individuals and groups may be afforded tertiary learning that is characterised by an expanded view of the participant's system. Later sections of this thesis contribute to the existing literature by showing that children frequently actualise schoolyard objects, places and spaces to configure primary, secondary and tertiary artefacts.

2.3.2 Mesosystems

Mesosystems comprise constellations of microsystems and the interactions between them; as with space they are an "ordering and arrangement of the world produced through social relations and practices" (Castree, Kitchen & Rogers 2013, p.479). For example, mesosystem elements may consist of:

- outdoor processes that nurture a child's sense-of-self (Hattie, Marsh, Neill & Richards 1997) during scouting that may beneficially influence social participation in other microsystem contexts;

[29] In this sense tertiary artefacts, such as *GfL*'s schoolyard, are, following Archer's (1995) dualism, both the rules and resources of Gidden's (1984) structuration theory.

- views of nature that influence girls concentration and impulse inhibition (Faber Taylor, Kuo & Sullivan 2001); and,

- neighbourhood values that reinforce parental expectations (Wachs 2000).

Although some research relates mesosystem conditions with particular outcomes in specific cases, in general mesosystems are regarded as complexes of interactions. Widespread urban consolidation and the growing use of private cars together with an associated parental anxiety regarding road safety and crime (Collins & Kearns 2004, Fulton et al. 2005, Recsei 2005, Thomas & Thompson 2004, Ziniani, Kopeshke1 & Wadley 2006, Ziviani, Kopeshke1 & Wadley 2006) are, for example, increasingly restricting Western children's outdoor activities to places that are designed for children (Rasmussen 2004). Gillis (2008, p.316) goes further and argues that these mesosystem forces are producing a generation that is "islanded" in places such as schoolyards, council playgrounds (Kylin 1999, Wyver et al. 2010) and commercial playspaces (McKendrick, Bradford & Fielder 2000). Kyttä's (2004) research shows that children's ability to move between different microsystems is related to their capacity to actualise affordances and, consistent with this, others argue that reduced freedom to roam influences childhood obesity (Crowle & Turner 2010), cognitive functioning (Kellert, Heerwagen & Mador 2008) and self-discipline (Faber Taylor, Kuo & Sullivan 2001a). These arguments are then configured as support for interventions in microsystems (e.g. Burdette & Whittaker 2005, Chawla & Cushing 2007, Council of Australian Governments 2009, Shackell, Butler, Doyle & Bell 2008) or mesosystems (e.g. Freeman & Tranter 2011, Health and Safety Executive 2002, UNCRC 2013).

In practice *GfL* acknowledges the complex, recursive nature of mesosystems but maintains a focus on changes in children's activity that emerge from within the study-site schoolyard microsystem. Should changes in activity (or meaning) be observed that do not have their genesis in schoolyard affordance actualisations these will be discounted from *GfL* analysis.

2.3.3 Exosystems

Exosystems consist of the dynamic interactions and relationships between "various formal and informal social structures" (Iarocci et al. 2007, p.4) in which an individual is theoretically part but of which they may have no awareness. Evans et al. (2010) show that the established link between crowding and attenuated infant development is, for example, at least partly explained by the effect of crowding (in the infant's exosystem) on the mother and that it is her subsequent behaviour (in the infant's microsystem) that influences development. Similarly, a child's exosystem includes the professional learning networks in which his/her teachers participate (Winter 2004) and the school's maintenance practices (Roberts, Edgerton & Peter 2008), both of which influence on the type of schooling children experience.

Playground designs that are “dominated by static equipment … [and largely preclude] … imaginative play” (Wake 2008, p.425) respond to fears about children’s safety in public spaces and “concerns for their proper, rather than uncontrolled, development” (Holloway & Valentine 2000, p.13) are also part of children's exosystems. To this point in history static playgrounds dominate Western provision (Collins et al. 2010) but emerging evidence challenges rule makers to reconceptualise relationships between child agency, physical environments and risk. For example, current South Australian Department of Education and Child Development documents require that school leaders give "careful attention" (DECS 2010a, p.20) to playgrounds so that children are “kept safe *at all times*” (DECS 2007, p.1) but, at the same time, advocates who seek to reposition risk as potentially positive (e.g. Mitchell Cavanagh & Eager 2006) argue that, even where risk prevention dominates, there is “no sign of a downward trend in overall numbers of injury cases” (Ball 2002, p.i). Additionally, advocates discuss surplus safety as generally resulting in impoverishment of experience (e.g. Evans 1993, Moore 2006, Wyver et al. 2010) that:

> “deprives children of their recognised right to play, deprives them of perceived important developmental experiences including ability to handle risk, and may in fact place them at greater risk overall by displacing them to more dangerous places and activities” (Ball 2002, chapter 8.1).

Exosystem rhetorics, though remote from children's sphere of influence, clearly have the potential to influence schoolyard experiences so the study site's design, its interpretation of risk and its teachers' professional learning are discussed later in this thesis.

2.3.4 Macrosystem

Macrosystem*s* comprise the cultural or sub-cultural attitudes and institutions that embody prevailing worldviews and shape lower-level systems. Two contemporary rhetorics that influence conceptualisations of places for children are (i) educational emphases on dispositions and (ii) Wilson's (1984) biophilia hypothesis. Each of these rhetorics is briefly introduced below.

Educational Reform

Education reformers argue that school environments ought to be reconceptualised and redesigned as educative resources (e.g. Billmore et al. 1999, Cosco & Moore 1999, de Kock et al. 2004, Dyment 2004, 2007 & 2009, Education Development Centre 2000, Huse 1995, Moore 1986a & 1986b, Richardson 2006) and reformist views are now expressed at the highest levels (e.g. UNESCO 2000). Today policy makers are encouraged to provide physical environments that encourage learning (Theisens, Benavides & Dumont 2008) but to date policy and practice has focussed on school curricula and buildings (Gruenewald 2003) so the design of school grounds has changed little (Heerwagen & Orians 2002) and 150 year-old concerns (Moore 2006) continue a legacy of playground provision (Collins et al. 2010) that is “dominated by static equipment … [and largely precludes] … imaginative play” (Wake 2008, p.425). Additionally, because schoolyard influences on learning are to a large extent not considered or clearly understood by educators (Cosco & Moore 1999), “adult values and needs, rather than those of the children … mould many school grounds (and policies on their use)” (Tranter & Malone 2004, p.153). Consequently a “mismatch between formally designed playgrounds and the more flexible landscapes … which children actually prefer to play in” (Holloway & Valentine 2000, p.12) is the norm guiding the development and use of a majority of outdoor places for children. Contemporary education is moving from models that transmit culturally valued knowledge toward a focus on dispositions (Carr & Claxton 2002, Claxton 2008) however, and reformist views, which to date have had little influence on mainstream schoolyard design, may yet embrace adventure play's emphasises on experimenting, making and destroying as a means to promote "active engagement ... social solidarity and individual responsibilities” (Kozlovski 2008, p.172). Chapter four of this thesis demonstrates that *GfL*'s study site has much in common with adventure playgrounds so the current research provides an opportunity to test how playground provision and regulation may support contemporary educative purposes.

Biophilia

Wilson's (1984) biophilia hypothesis suggests that humans have an innate need to affiliate with the biological world and it also influences contemporary rhetorics. In support of Wilson's hypothesis a range of studies and reviews outline circumstantial evidence that people respond in fundamentally different ways to 'natural' and built environments (e.g. Maller, Townsend, Brown & St. Leger 2002, Ely & Pitman 2012, Martin 2011, New South Wales National Parks and Wildlife Service 2002, Ulrich 1984, van den Born et al. 2001, Winter 2004). For example:

- Bell and Dyment's (2008) meta-analysis associates greening school grounds with improved academic and wellbeing outcomes for children;
- Mayer et al. (2009) demonstrate that exposure to natural settings enhances one's mood and ability to reflect on life circumstances; and,
- Dadvand et al. (2015, p.7937) identify a "beneficial association between exposure to green space and cognitive development among schoolchildren."

Interpretations of research related to biophilia informs both contemporary suggestions that access to nature offers physical, mental and learning benefits (e.g. Blackmore, Bateman, Loughlin, O'Mara & George 2011, Ely & Pitman 2012, Martin 2011) and practitioner views that natural materials and settings ought to be part of childhood learning environments (e.g. Moore & Cosco 2003, Young & Elliot 2013). The latter of these follows North American, British and Australian individuals and interest groups[30] who have, for some decades, advocated remaking children's environments. These advocates challenge traditional conceptualisations of places for children - what Kozlovski (2008) refers to as outdoor gymnasia and what Evans (1987) calls monuments to misunderstanding - and their cumulative influence is evident in regulation number 113 of Australia's *Education and Care Services National Regulations* (Ministerial Council for Education, Early Childhood Development and Youth Affairs 2014) which now mandates access to 'natural' elements for all children who attend pre-school centres. At the same time there is no stipulation removing existing traditional apparatus so the best interpretation available to this review is that current practice follows Wachs' (2006, p.305) advice that "the most useful strategy [in designing places

[30] E.g. USA: Moore and Wong (1997); Natural Learning Initiative; Landscapes For Learning; &, The Nature Conservancy. UK: Allen (1968); Learning Through Landscapes; Royal Society for the Preservation of Birds; &, The National Trust. Australia: Evans (1987); Nature Play; Play Australia; & Planet Ark. See Johnson (2000) for an introduction.

for children] may be to provide a variety of environments in the hope that children can respond to different aspects".

2.3.5 Meta-level influences

Meta-level influences include changes in ecosystem services (e.g. D'Amato & Cecchi 2008, McMichael 2001, Woodruff et al. 2006), urban form (e.g. Boal 1968, Canals, Boisot & MacMillian 2008) and conceptual understandings that affect macrosystem change. Discussing the full range of such influences on children's outdoor activity is beyond the scope of a single study but *GfL* acknowledges that post-structuralist views shape its research. In section *2.2 Proximal processes: learning* this study cites well-regarded research which finds that evolutionary history affects behaviour, personality and cognition. Subsequently, *GfL* acknowledges that maturational views inform assumptions regarding childhood 'play' but that post-structuralist perspectives question the concept (e.g. Fleer & Peers 2012, Harker 2005). In coming to terms with this meta-level dilemma *GfL* notes that researchers generally (Sutton Smith 2011) and Australia's *Early Years Learning Framework* (Council of Australian Governments 2009) position 'play' as supportive of learning. Therefore, whilst exploring children's outdoor learning via a phenomenological appreciation of learner's self-chosen schoolyard affordance actualisations (during which some children may be playing), the study sidesteps meta-level theorisations. However, given the ongoing dialogue and re-working of meta-level rhetorics and the need for conceptual clarity *GfL* resorts to definitions of key context-related concepts that integrate understandings from psychology, education and human geography.

Contextual definitions

GfL describes the processes that influence children's learning in one schoolyard over a period of one academic year and the following definitions are intended for use in this conceptually, spatially and temporally bounded context. Each definition has two purposes, first to effectively précis contemporary understandings of the concept involved, and second, to flag children's awareness of the phenomena.

Place

Post-structuralist views allow that agents, including children (e.g. Aitken & Plows 2010) configure worlds or places (e.g. Fleer 2011, Hennessy & Amabile 2010, Lester & Russell 2008, Mugerauer 2010) so, for the purposes of this study, Meinig's (1979) description of place is deemed useful. He states that place is both a "creation and accumulation" that is understood as a publicly agreed local and private concept. Public place, writes Meinig, has a:

> "name, location, and character; some legibility, some identity commonly understood. Our personal sense of place depends upon our own experiences and sensibilities. It is unique to each of us in its content and in the way it relates to general social definitions of places" (Meinig 1979, p.3).

For consistency this study henceforth names, locates and describes study-site places phenomenologically using terms that the study participants most frequently adopt. Additionally, the scale at which places are described reflects awareness that adults often accept broad definitions of place (Moore 1986a) and "seldom recognize the multiplicity of opportunities that children perceive when viewing the natural and physical world" (Matthews & Limb, 1999, p.28). Children differentiate places at a "very small scale" (Hart 1982 p.2, Kylin 1999, Rasmussen 2004) and their imaginative activities are known to create experiences, artefacts and places (Elkind 2009) so, following Relph (1976), case studies will explore how children experience configurations of content, activity and meaning in relation to their personal sense of place. Also, if children's affordance actualisations crystallise a legacy of artefacts and places these will be considered as potential influences on "perceptual and cognitive understanding of the world" (Wartofsky 1979, p.277).

Schoolyard

Schoolyard refers to the constellation of material elements at the study site and within the normal range of children's activities (see Figure 5).

Space

Kaplan, Kaplan and Ryan (1998, p.10) indicate that "the information in an environment derives not only from its contents but also from its organisation" so, for *GfL*, space is the arrangement of schoolyard places and non-places as well as the forces that hold them in being. Given this study is of children's learning, descriptions of space respect scales relative to the child-participants *and* their affordance actualisations. That is, for *GfL*, space is the schoolyard considered topologically. For example, two children sharing information about mud pies will be considered to be in the same place if they exchange objects or information non-verbally, by hand or spoken word. Conversely, children engaged in co-located compatible activities that do not interconnect will be considered as being in different spaces. Additionally, different activities that impinge on one another (even if they are several metres away) will be considered as sharing the same space. Higher-level elements such as rules, time and the proximity of other places also influence experiences of space and place but *GfL* considers these indeterminate until their influence is manifest, consequently these elements are discussed in *Results part three: Stories of self-chosen schoolyard affordance actualisations.*

2.3.7 Synopsis: context

In *Necessary But Not Sufficient* Wachs (2000 p.139) writes that contexts have traditionally:

> "been viewed either as a setting within which the child learns appropriate social relationship patterns, as a source of stimulation for the individual, or as a context that provides the child with opportunities to practice specific skills."

By positioning learners as participants in emergent multi-level systems contemporary views incorporate much of the existing literature that describes relations between places, spaces, environments and learning. Significantly, these views also conceptualise learning as a system in which learners are participants; “Knowledge and learning - the processes by which people create knowledge", write Senge, Cambron-McCabe, Lucas, Smith, Dutton and Kleiner (2000, p. 22), "are living systems made up of often-invisible networks and interrelationships – a complex living system”.

How contexts are related to learning is a subject of ongoing inquiry but *GfL*'s review of ecological psychology, neo-Vygotskian theory and Bateson's (1972) framework suggests two ways that research into environmental influences on learning can address this blind spot. First, following Miller's (2003, p.14) observation that the "transformation of understanding that mediation achieves ... is revealed in new ways of acting and experiencing the world", *GfL* research focuses attention on learner's affordance actualisations that have their genesis in changes in the schoolyard microsystem. Second, given this review's contention that systems views may sustain research on learning that emerges from the “interaction of individuals and physical and social situations” (Barab & Plucker 2002, p.165) *GfL*'s research is sensitive to how learners respond to (i) schoolyard material qualities, (ii) configurations of schoolyard artefacts and (iii) discordant meanings that emerge from within the system.

2.4 Personal characteristics: Images of the child

> *"Dominant constructions of childhood ... have formative, shaping power on children's real lives"* (Mercer 2005, p.4).
>
> "*We can, if we so choose, construct our images of children in a different mould. We can choose to see them as essentially divergent, rather than convergent, inner-directed, rather than other-directed, and competent, rather than incompetent"* (Drummond 2008, p.9).

2.4.1 Introduction

GfL explores the means by which schoolyard relationships with materials and phenomena influence children's learning and, following the Bioecological Model of Human Development (Bronfenbrenner & Morris 2006), this section builds on systems views to present an interpretation of the historical context in which child-learners are conceptualised. Then, with the ongoing influence of historical rhetorics in mind, three categories from the bioecological model are used to discuss the personal characteristics that are related to learning and the environment. These categories are:

(i) *Resource characteristics*, or the capacities and experiences an individual brings to a given situation;
(ii) *Demand characteristics*, or the attributes that prompt reactions from the immediate social environment; and,
(iii) *Dispositional characteristics*, or tendencies that influence individual motivation and action (Bronfenbrenner & Morris 2006).

This section then surmises that differentiation of learners' resource, demand and dispositional characteristics is beyond the scope of *GfL*. Instead chapter three introduces Westling-Allodi's (2007) interpretation of values theory (Schwartz 1992) as an instrument that differentiates personal value priorities.

2.4.2 Childhood

In some quarters there is a "view that childhood is much the same across historical and cultural boundaries" (Lam 2008, p.27) but images of the child and childhood are key epistemological factors in child-environment studies (Aitken & Plows 2010, Moran-Ellis 2010). Simplistic constructions position childhood as a period in the human lifespan that is characterised by particular behavioural and biological features (Mergen 2003) including, for example, the appearance of adult molars and rapid language development that characterises children aged three to seven years and tendencies to play that characterise ages seven years to mid-teens (Geary & Bjorklund

2000). Modern childhoods are understood as more than biological phenomena and, although the contemporary literature accepts biological maturity as a factor in learning and development, childhood itself is positioned as an evolving construct that emerged in seventeenth century France and became “a social norm and an imperative of social existence” (Gillis 2008, p.321) in the developed world during the nineteenth century (Hughes 2010). Unsurprisingly then, contemporary views and interpretations of the child reflect the range of sometimes-conflicting historical values, beliefs and theories of child development (Holloway & Valentine 2000, Hughes 2010, Kraftl 2006, Nimmo 1998, Wyman 2005). For example, the evil child described by St. Augustine [354 - 430] (Wyman 2005) “remains pertinent to current public concerns” (James, Jenks & Prout 1998, p.11) and St. Thomas Aquinas's [1225–1274] child of great potential (Pasnau 2002) is present in Malaguzzi’s (1995) strong and creative child. Given the multiplicity of such views, contemporary research accepts that discourses related to children and childhoods are open to recontesting and reconstruction (Aitken & Plows 2010, Holloway & Valentine 2000, Nuttall & Edwards 2007, Whiteman, De Gion & Mevawalla 2012).

Contemporary constructions of childhood posit that "the 'being' child can be understood in its own right. It does not have to be approached from an assumed shortfall of competence, reason or significance" (James, Jenks & Prout 1998, p.207). Thus, in addition to what are now mainstream procedures for the ethical conduct of university supervised childhood research, *GfL* recognises study participants' subjectivity/agency by documenting both socially valued learning that is described in curriculum documents and remaining open to the learning participant's construct for themselves. Additionally this study embraces children's participation in and reflections on the research through its flexible, responsive research methodology. These processes make children visible in *GfL* and represent children's perspectives on the "themes, patterns and differences within children’s experiences" (Beazley, Bessell, Ennew & Waterson, 2009, p.369) of schoolyard affordance actualisations.

2.4.3 Personal resources

Personal resources are the conditions, abilities, experiences, knowledge and skills that constrain or "expand freedom of action, and enable [or disempower] people to serve as causal contributors to their own life course" (Bandura 1989, pp.7-8). For example, knowledge of vocabulary is a personal resource that is related to adolescent's effective reading comprehension (Laflamme 1997) and one which enables both receiving complex information and healthy social interactions (National Institutes of Health 2005).

Some systems views make no separation of agents, actors or artefacts (e.g. Actor Network Theory) and in these views there is little if any separation of "good food, housing, caring parents [and] educational opportunities" (Tudge, Mokrova, Hatfield and Karnik 2009, p.200) and personal resources. In contrast, and consistent with Chawla, Keena, Pevec and Stanley (2014), this review suggests it is not only possible but also desirable to differentiate personal resources from material elements within a system view. Moreover, *GfL*'s proposed differentiation is consistent with the literature which generally focuses on (i) self-efficacy, (ii) self-esteem and (iii) optimism as key personal resources that moderate of person-environment relationships (Xanthopoulou, Bakker, Demerouti & Schaufeli 2007, p.124).

Documenting how schoolyard activities influence children's learning - and the development of personal resources - is a key aim of this study. Therefore, whilst maintaining a systems view, *GfL* follows Vygotsky (1934/1978) and Bateson (1972) to discern if evidence shows affordance actualisations, mediation and transformations of meaning becoming personal resource characteristics. Standard psychological instruments are available to evaluate personal resources (Butcher 2009) but *GfL* takes a utilitarian approach which holds "that actions are right in proportion as they tend to promote happiness" (Mill 1863, p.9) or, as in more recent descriptions, the value of an action is in relation to its effect (Rae 2009). In so doing this study does not undertake pre-testing of embedded case study students but relates affordance actualisations to effects on participant self-efficacy, self-esteem and optimism.

2.4.4 Demands

An individual's demand[31] characteristics are personal attributes that "invite or discourage reactions from the social environment ... [and] ... foster or disrupt the operation of proximal processes” (Bronfenbrenner & Morris 2006, p.795). Research shows, for example, that a person's birth order or language/s spoken at home (Margetts 2003), mature facial features (Madera & Hebl 2012) and even adult tooth colour (Kershaw, Newton & Williams 2008) each influence how others respond to an

[31] Demand, as it is used here, differs from researcher demand characteristics that elicit responses from study participants (Crano 2004).

individual in question. Some responses to demand characteristics are immediate (e.g. surprise) but others, even supposedly impartial sentencing by courts of law, are influenced by factors such as race (Sporer & Goodman-Delahunty 2009).

In the context of this study demand characteristics are a reminder that this researcher, study-site staff and student behaviours are potentially influenced by the characteristics that others present in schoolyard encounters. Given that *GfL* explores the influence of actualising physical affordances, demand effects on learning are not problematized in this study. However, personal characteristics such as "age, gender ... and physical appearance" (Tudge et al.2009, p.200) are considered in this study's *Design of inquiry* chapter in order to ensure maximum variation sampling of embedded case study participants (Patton 2002).

2.4.5 Dispositions

Aristotle introduces dispositions as the recurring frames of mind that a person brings to ethical or moral situations (McKnight 2004, p.214) and the bioecological model discusses dispositions as tendencies in the pattern of human responses to proximal processes. Specifically, Bronfenbrenner and Morris (1998, p.1009) indicate that dispositions invite “differentiated response[s] to ... and exploration of aspects of the physical and social environment.” *GfL* notes that this account is strongly congruent with ecological psychology's description of calibrated perception recognising and responding to salient affordances so suggests that dispositions and calibrated perception may be analogous. Significantly changes in dispositions (or calibrations of perception) represent learning so are of central interest for this study,.

Fifty years ago dispositions were of interest to behavioural psychologist Skinner (1964, p.484) who suggested that a focus of attention for school education should increasingly be “the specific intellectual skills, abilities, attitudes and tastes which are now taught mainly as by-products of content instruction." Today this concept of dispositions attracts increasing interest from educators. Contemporary authors (e.g. Dottin 2009, Rike & Sharp 2008, Sockett 2009, Thornton 2006 & Villegas 2007) are in accord with Skinner when they discuss learning dispositions as default responses (Claxton & Carr 2004), habits of mind (Costa 2000, Katz 1988), key competencies (Rychen & Salganik 2003), participation repertoires (Carr 2001), triggers of intentional behaviour (Splitter 2010) and traits, thought processes, attitudes, habits, inhibitions and motives (Katz 1993). These and many similar discussions now ensure that dispositions are prioritised in both the *Australian Curriculum* (as "general capabilities" - ACARA 2013b, p.3) and the *Early Years Learning Framework for Australia* (Council of Australian Governments 2009, p.33). In addition the *South Australian Teaching for Effective Learning Framework Guide* (TfEL 2010, p.9) names development of learning dispositions as one of the twin goals for contemporary education.

In learning-related literature the concept of dispositions suggests that if an agent is not disposed or does not have a tendency to respond to environments then little or no learning will occur (Sadler 2002, p.45-46). *GfL*'s review suggests that such interpretations are consistent with (i) the final iteration of the bioecological model positing dispositions as animators of proximal processes and (ii) ecological psychology's suggestion that perception becomes attuned to, and is necessary for, actualisations of affordances. This confluence of two differing approaches increases confidence that *GfL*'s attending to how students' schoolyard affordance actualisations are related to changes in dispositional characteristics is a valid means to discern environment-related learning.

2.4.6 Synopsis: personal characteristics

Systems views conceptualise childhood as an "unstable and contingent result of ... situated encounter[s]" (Nieuwenhuys 2013, p.5) and draw researchers' attention to the potentially multiple dimensions of any experience. In this context the psychological literature highlights that individuals bring resource, demand and dispositional characteristics to encounters with their environments. Of these personal characteristics, *GfL*'s review suggests that dispositions, self-efficacy, self-esteem and optimism are key influences on children's schoolyard activities. Detailed examination of personal characteristics is a major study, however, and is beyond the scope of *GfL*. Nevertheless, this research design accounts for personal characteristics both when selecting embedded case study participants and discussing findings. Regarding the former, value theory (to be introduced in chapter three) provides a “a way of organizing the different needs, motives, and goals proposed by other theories” (Schwartz 2010, p.1) so it offers a means for *GfL* to discern key motivations that children bring to learner - environment relations. In terms of the latter, *GfL* remains open to the possibility that affordance actualisations may be related to changes in personal resource and dispositional characteristics. This study therefore seeks rich data that may provide evidence of relations between personal characteristics and learning dispositions.

2.5 Time

> *"Time and place are central categories in conceptualizing the transient, ordinary nature of every-day life"* (Rasmussen 2004, p.155).

2.5.1 Introduction

Markosian (2014) describes theorisations of time as embracing Aristotle's (1984) ancient writing, Einstein's (1916/1920) time-relativity and contemporary inquiries into spacetime (e.g. Muller, Peters & Chu 2010). According to Dowden (2013) this history offers two distinct conceptualisations; one of flowing time in three-dimensional reality (the time in which Rasmussen (2004) situates everyday life) and, the other - relational time and space. Whilst these two time-perspectives generate numerous unresolved issues there is, nevertheless, a consensus that humans *perceive* events in time (Le Poidevin 2009).

Earlier this review discussed biological maturity (personal time) in relation to childhood and personal characteristics. Generally maturity is considered the significant time-related dimension of learning and development but Bronfenbrenner (1995) posits that time and timing are also salient environmental features. Following the bioecological model[32] this section therefore reviews three learning-related dimensions of environmental time[33] - macro-time, meso-time and micro-time.

2.5.2 Macro-time time

Macro-time relates to the historical contexts in which experiences occur and, for this study, it highlights that some conceptualisations of learning, context and childhood have been considered a good fit in one period and rejected as inappropriate in another. For example, a recent communication from the Australian National Children's Commissioner (2013, p.24) recommends a total ban on corporal punishment but Wyman (2005, p.415) notes that:

> "For centuries, it was considered parents' moral and religious obligation, not to nurture their children, in our current sense of that word, but to beat the wilfulness out of them."

Similarly learning has, at different times, been considered a process of nature, nurture or

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[32]Bronfenbrenner and Morris (2006) use the terms microchronological systems, mesochronological systems and macrochronological systems. For simplicity this review uses Bronfenbrenner and Morris's (1998) earlier terms.

[33] *GfL* accommodates personal time (maturity, circadian rhythms etc.) that relates to micro-time experiences in this study's methodological and observational phases.

mental construction whereas today systems views are highly regarded. Likewise, environment's influence on learning has been variously considered deterministic, passive or possibilistic. Whilst conceptualising macro-time does not resolve these differences it nevertheless foregrounds historical perspectives as influences on learner behaviour and thinking as well as researcher practice. For this reason macro-time aspects of learning and context are introduced throughout this review and are further considered in the case selection section of *GfL*'s methods chapter.

2.5.3 Meso-time

Meso-time relates to intervals of continuity and dis-continuity (over either short periods or extended intervals) that are known to influence an individual's learning and development (e.g. Chawla & Cushing 2007, Wachs, Georgieff, Cusick & McEwen 2014, Withnall 2006). Conceptualising meso-time in these terms allows the bioecological model to accommodate research which shows, for example, that recurring periods of maternal depression reduce children's ability to effectively cope with life circumstances and related stress (Radke-Yarrow 1994).

At a school-level, organisational structures such as daily or weekly timetables and periodic holidays have meso-time implications because they spatially and temporally divide learning experiences (e.g. OECD 2013, Sebba 2007, p.25). If, for example, such organisational requirements cause individuals to feel that they have "little control over the events in their life and so respond[s] passively to the problems that they encounter" (Camacho, Verstappen, Chipping & Symmons 2013, p.1233) the events can produce the undesirable phenomena that Hiroto and Seligman (1975) term learned helplessness. Conversely, others discuss discontinuities in meso-time as potentially positive; Aitken (2001), for example, constructs time-spaces as supportive of children's reflection on experiences and Robbins (2007) differentiates perception in terms of (i) physical time as described by the regularity of a metronome and (ii) the rhythms (states *and* spaces) that characterise relational time-spaces. Hofmeister (2002 p.105) elaborates how rhythms, or topological conceptualisations of time, may benefit children when she writes that, in urban planning:

> "Transitions are intermediate, or liminal, times and spaces. Transitions mark the ‘time-space’ between (at least) two islands of space and time: between different locations, between different actions, events and life phases. Intermediate time-spaces – ‘intervals’ – enable us to identify change."

By pointing to the possibility that intervals in meso (and micro) time may facilitate perceptions of change Hofmeister reconnects experience of time with potential learning. Hofmeister's premise is that transitions enable learning through reflection - a process that is already well documented[34] - but *GfL* embraces proposes an alternative; this study's synthesis of ecological psychology (Gibson 1992), neo-Vygotskian theory (Miller 2003, 2011) and Batesonian (1972) double binds suggests that flows, boundaries and indeterminacies of time-space that children perceive as continuities and discontinuities may provoke learning through mediation and perception. This possibility is explored in *GfL*'s research.

2.5.4 Micro-time

Dowden (2013) theorises that, when awake, humans experience time as continuous; a perspective that is clear when Rasmussen (2004, p.155) writes that "the everyday life of children ... flows along because children live their lives in a stream of time." Micro-time, however, focuses researcher attention on "continuity versus discontinuity within ongoing episodes of proximal processes” (Bronfenbrenner & Morris 1998, p.955). In this study continuity of ongoing episodes includes, for example, students who are involved in soccer carrying team structures and scores into different sessions (separated by two-hour periods of instruction) and some children continuing their cubby-building activity in twice daily periods over several months. Micro-time then, does not necessarily imply short periods of physical time.

Continuity in micro-time may extend over months but school organisational structures tend to prioritise short periods of activity. In many schools, for example, the practice of providing breaks from instruction (Education Regulations 2012, p.30), which are described as 'outside learning times' at Deepwater and recess and lunch in other schools (New South Wales Public Schools 2009), generate rhythms of regular, time-constrained outdoor activities. The implications for learning of regular, albeit temporally limited, access to schoolyards are the subject of *GfL*'s research but the concept of micro-time makes clear that these periods should not be considered as wholes. Colley, Hodkinson and Malcom's (2003) *Informality and Formality in Learning: A report*, for example, draws attention to the likelihood that micro-time may be experienced as shorter episodes of physical time within periods of activity. In

[34] E.g. Dewey 1933, Farrell 2004, Kolb 1984, Kolb & Fry 1975 Korthagen & Vasalos 2009, Rodgers 2002, Schön 1983 & York-Barr et al. 2001.

particular the report indicates that non-formal and informal learning are characterised by recurrent, short cycles that support personally relevant, open-ended and often on-going learning. This research therefore anticipates that children may repeat actions on objects in Deepwater's schoolyard and the study is hopeful that incremental changes over time may be indicative of learning.

The concept of micro-time also raises the possibility that, within brief or extended and continuous or discontinuous episodes of affordance actualisations, students may perceive time as moving at different rates. For example, increased or reduced calls on children's attention that arise from being alternatively absorbed in an activity or performing routine tasks/daydreaming can facilitate altered states of consciousness (Dietrich 2003) that are experienced in what Csikszentmihalyi (1975) calls flow and microflow. In Csikszentmihalyi's (1975, p.36) original definition flow is "the peculiar dynamic state - the holistic sensation that people feel when they act with total involvement." Flow can be experienced as either timelessness (when one is completely absorbed in an extended event) or slow motion[35] (when intense concentration allows one to perceive and recall a brief event in detail). The occurrence of flow is usually related to configurations of four elements, viz: interest, enjoyment or concentration, clear goals and feedback that is "immediate and forthcoming" (Shernoff & Csikszentmihalyi 2009, p.132). For *GfL* similarities between conditions which promote flow and potential experiences of self-chosen affordance actualisations suggests an intriguing possibility that is implicit in Gibson's (1992) and Robbins's (2007) work; students may become so attuned to activities which extend over several days that they perceive what would normally be described as disconnected events (or states) as contiguous. For example, a child who undertakes an affordance actualisation at each outside learning time over several weeks may have the sense that he/she is involved in the same activity. Extending this line of thinking suggests the intriguing possibility that experiencing flow may allow individuals to notice normally imperceptible changes that occur over extended periods as if they occurred in one relatively short period. *GfL* therefore remains mindful of this possibility during the design, data collection and analysis phases of this research.

The concept of microflow conceptualises "activities like doodling that are short in

[35] This phenomena is not conceptualised as actually slowing of time but is accounted for in terms of high definition, post-event memories (Stetson, Fiesta & Eagleman 2007).

duration, interstitial and subordinated within the stream of action, and often so routinized as to occur almost outside awareness" (Nakamura & Csikszentmihalyi 2002, p.102) as potentially supporting attention. For example, yawning or stretching may facilitate ongoing involvement in other actions. If, as Csikszentmihalyi (1975) proposes, microflow activities are repetitive and regulate attention there is a strong likelihood of them being observed during children's schoolyard affordance actualisations and, therefore, of them contributing to *GfL*'s later discussion. Given that this study examines children's learning during what are traditionally called recess and lunch breaks, *GfL* is unable to elaborate the influence of micro-time activities on attention and subsequent learning beyond outside learning times but this review notes parallels with Pellegrini's (2005) and Groves and McNish's (2011) discussion of recess and lunchtime activities potentially supporting later in-class behaviours.

2.5.5 Synopsis: time

Proximal processes occur in and through time and space but learners do not experience either as homogenous. For those absorbed in an experience time may fly and, during intense concentration, it may seem to slow. Across experiences too, time and space are equally fickle; in some circumstances continuity may inhibit agency and in others it may enhance individual capacity. For learners, researchers and this study, time cannot therefore be an absolute and the focus is not so much the how time exists but how perceptions of it are related to learning.

2.6 Synthesis

Grounds for Learning's literature review uses the bioecological model's categories to present expositions of theorisation and research that relate to learning and environments. In the first section of this review mechanistic and organismic views on learning are shown to have different emphases but systems perspectives, which position always-situated proximal processes as both enabling and constraining learning, are found to offer a contemporary synthesis of how proximal processes influence learning. The second section of this review conceptualises the multi-level interdependent contexts that influence learning. learning. Microsystem elements are posited as directly influencing proximal processes and learning whereas distal elements are constructed as constraining or enhancing proximal processes. The focus of this study is on how microsystem elements influence proximal processes but the case selection part of this thesis, which presents an overview of the study site's embedding higher-level contexts, will allow readers to discern how distal elements influence proximal processes at *GfL*'s research site. The third section of this review acknowledges that children bring personal characteristics to experiences of proximal processes. *GfL* does not seek to control for variations in personal characteristics however, rather it employs methods to maximise the benefits of observing a diverse group of case-study participants. These methods are described in the next chapter of this thesis. The fourth section of this review indicates that children's learning is influenced by three dimensions of time and that the salient variable is how learners perceive time.

In setting forth to design its inquiry *GfL* notes that psychology does not traditionally describe environments as differentiated variables (Preiss & Stenberg 2005) and that “very little research has been conducted on children’s behaviour at recess generally, and on the implications of these behaviors for education” (Pellegrini 2009, p.212). Therefore, whilst keeping in mind Casey's (1993, p.23) conclusion that “to be somewhere (to exist) is to be in place and therefore to be subject to its power, to be part of its action, acting on its scene”, *GfL* proposes a new synthesis of:

- ecological psychology's conceptualisation of perception as direct and immutably linked to relational affordances;
- neo-Vygotskian theory which posits that emplaced cultural artefacts mediate learning by allowing learners to suspend their agency and become actors who experience phenomena from another's perspective; and,
- Batesonian double binds which may afford children perception of continuities and contradictions that provoke higher-level learning.

It is with the new synthesis of these three established theories that *GfL* research aims to investigate how self-chosen affordance actualisations with material and conceptual elements influence children's schoolyard learning.

3. Design of Inquiry

“No process occurs outside of a context. And if we want to understand context, we need to take it into account, not to pretend to control it away”
(Steinberg et al. 1995, p.424, cited in Bronfenbrenner & Morris 2006, p.1016).

3.1 Introduction

This thesis is the report of an embedded case study that responds to a growing body of literature insisting that "places teach us who, what and where we are, as well as how we might live our lives" (Gruenewald 2003, p.636). It focuses on how human-environment relationships influence learning to address the finding that "little attention is paid to ... outdoor spaces ... [in relation] to pedagogies and learning" (Blackmore, Bateman, Loughlin, O'Mara and George 2011, p.v). Steinberg et al. (1995) identify context as a key variable in case studies so *GfL*'s research design follows observation Robbins's (2010, p.243) and searches for evidence of learning in the:

> "connections and mutual flows between the human and the non-human; varying conceptual and categorical arrangements that make the non-human world conceivable by human beings; and, impacts, alterations and changes of state".

Searching for contextual evidence “is extremely difficult to do in statistical studies but is common in case studies" (George & Bennett 2005, p.19) so *Grounds for Learning* selected an embedded case study approach (Yin 2003) for researching how schoolyard activities were related to learning. Although the research explored a small number of participants' spatial experiences within a single bounded case, it was apparent that space and place could be interpreted in a variety of ways. As a researcher I therefore made a post-structuralist choice to:

> "theorise space as fluidly relational ... viewing spaces and places as continually remade by networks of power, by people and by interactions with the (many) materials of the material world" (Bright, Manchester & Allendyke 2013, p.749)

Consequently a significant part of this thesis deconstructs and describes the study-site's spatial qualities and interprets how children perceive the action potentials of each place.

There is a global consensus that children demonstrate "choice and autonomy in their play" (UNCRC 2013, p.8) and sound evidence that they exercise this agency in activities that flow at different scales (Hart 1979, Kyttä 2003, Moore 1986a). The researcher is therefore positioned as in insider who uses the proven technique of video observation (Garrett 2011) when tracking children's varied, and potentially wide-ranging, schoolyard experiences. Videoing produced large quantities of rich data and I was aware of ongoing dialogue regarding "how to best represent research participants and their experiences in the write-ups and presentations" (Galman 2009, p.198) so considered including video excerpts in this thesis. With reflection it was felt that abstracting excerpts from their embedding context could negate the advantages of presenting learners in action. Additionally, synthesising and presenting large quantities of data in an accessible form was potentially problematic so this study followed Stanley (2008, p.445) and presented its findings as narratives "which largely backgrounded the specific detail ... and foregrounded broader ideas and arguments."

This final report is clearly one researcher's interpretation of children's schoolyard learning experiences but process tracing (George & Bennett 2005), pattern matching (Trochim 2000) and scrutiny by participants, their families, and teachers who knew both the site and children, ensures that it resonates as truthful. Feedback from audiences at a number of conferences verifies that the research methods, results and discussion also rung true for educators and academics in other contexts. Additionally, by describing *GfL'*s rationale and methods this chapter presents an opportunity to discern and judge the validity of study processes and interpretations.

The four remaining sections of this chapter describe *GfL*'s methods. Sections one and two introduce the study's perspective then its methodological approach. The third section, and the bulk of this chapter, outlines *GfL*'s research processes whilst also discussing the study site, selection of embedded case study students, data collection, analysis and the criteria for interpretation. A brief synopsis concludes the chapter.

3.2 Choosing a perspective

My search to understand how experience of place is related to learning began in post-graduate coursework that situated the practice of education in the context of ecological sustainability. In a paper written at that time I concluded that:

> “learning … is an on-going interpretive adventure which emerges from tensions between existing schemas, the context in which learning takes place, and the action of using both … learning requires that environmental affordances are perceived through learner actions" (Johnson 2007a, p.299).

I began this study hoping to discover causal pathways linking environmental elements and learning but, in reviewing the contemporary literature, the certainties of structuralism were abandoned and instead, descriptions and interpretations of interplays were countenanced. Paralleling this shift was a similar reimaging of learning itself; from conceptualising it as a progressive acquisition of knowledge or skills, to interpreting it as a growing expertise in systems of culturally valued practices (Booker 2010). In tandem too, this researcher reconceptualised knowing as “an interaction of individuals and physical and social situations” (Barab & Plucker 2002, p.165). As Dewey (1916/1964) put it:

> "If the living, experiencing being is an intimate participant in the activities of the world to which it belongs, then knowledge is a mode of participation, valuable in the degree in which it is effective. It cannot be the idle view of an unconcerned spectator" (Dewey 1916, p.393 cited in Rogoff et al. 1995, p.54).

Reviewing the literature also produced a similar movement in regards to the author's conceptualisation of play. In primary schools it has been common to assume that children play during their recess and lunchtimes but the literature showed that many childhood activities are a poor fit with the various definitions of play (Burghardt 2011, Cobb-Moore 2008, Fleer 2011, Meckley 1994, Pellegrini 2009). For example, Pellegrini (2010, p.27) discusses play and games as "separate constructs, with different ontogenies, proximal causes and functions." Thus, in the strong spotlight of academic rigor, inclusive definitions of play such as that proposed by the United Nations (UNCRC 2013) were set aside and this author accepted Harker's (2005, p.53) advice relating to the impossibility of defining play and focussed instead on "situated ‘action’ or performances of playing." *GfL*'s intention was, therefore, to research the spontaneous, everyday, non-formal activities - or affordance actualisations - that the literature suggests are important foundations for children's learning (Fleer 2011, Karpov 2005, Seo & Ginsberg 2003).

Reviews of the literature find little research documenting the influence of material contexts on the processes of children's learning (e.g. Gill 2014, Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment 2004, Rickinson et al. 2004) so *GfL*'s research was framed to discern how student's self-chosen schoolyard affordance actualisations were related to learning processes.

Kesby (2007, p.193) reminds researchers that, either explicitly or implicitly, "decisions about research methods are preceded by judgments about the nature of ontological reality and the appropriateness of epistemological modes of enquiry." For this author, *GfL*'s literature review confirmed that systems perspectives offer an appropriate basis for researching learner-environment relations. Strengthening this conviction were views from (i) psychology, where Wapner (2000, p.8) advises that researcher's "consider the person-in-environment system state as the unit of analysis", (ii) education, where Fleer, Hedegaard and Tudge (2009, p.9) advocate "a wholeness approach … in which childhood and children are seen in interdependent relation to their activities, institutional practices, and societal conditions" and (iii) geography, where Aitken (1992, p.557) suggests that "the transactional whole provides a context for study comprised of inseparable, reticulate, interdependent factors." I remained mindful, however, that different interpretive communities have "different schools of thought and different approaches to research questions" (Winchester 2000, p.16, Wynn 1999) and that research "methods need to be clearly tied to the theoretical foundation or paradigm to which they are linked" (Tudge, Brown & Freita 2011, p.121).

3.3 Choosing an approach

All research makes a fundamental choice about its method (Patton 2002); if a study asks *how many* it usually selects quantitative inquiry methods and if it asks *how* or *why* the explanatory power of qualitative methods is usually more appealing (Bradshaw & Stratford 2000, Suter 2012). *GfL*'s research asked how primary school students' schoolyard activities were related to learning and this situated the study in the realm of qualitative social science that typically employs case study methods to explore complex contemporary phenomena (Yin 2003). To this end *GfL* was conceptualised an embedded case study that focused on the role physical microsystem elements played in primary school students' learning at a single school.

Within research communities emphases change over time and, in recent decades, positivist standpoints have been challenged by post-structural/critical perspectives (McKendrick 2000). From these perspectives "creating a clear separation between investigator and participant is not only a chimera, but also prevents understanding the participant's reality from their perspective" (Tudge et al. 2011, p.122). With due respect to the conditions required by the supervising university ethics committee, *GfL* therefore adopted an overt insider perspective (Jorgensen 1989).

GfL's cross-disciplinary study of learner-environment relations needed both realist and relativist standpoints, so an interpretive phenomenology (Ezzy 2002, Seamon 2000) was employed to meld both etic and emic perspectives. This simultaneously descriptive and comparative method did not examine contextual elements per se; rather it focussed on children's experiences of them. Thus the research took an approach that, following Mugerauer (1994), sought a middle way between positivism and relativism, a perspective which geographer Ley (2009, p.585) describes as "possibilism". As is usual for case studies, *GfL* did not seek empirical validity for findings that would emerge from this approach, instead the study was positioned as a plausibility probe that would be available for intersubjective corroboration or rebuttal by other interpretive communities (Bailey 1992, Seamon 2000).

Heidegger (1953, p.33 emphasis in the original) writes that "the methodological meaning of phenomenological description is *interpretation*" so suggests there is no given procedure for designing or implementing a phenomenological case study. Seamon (2000, p.159) is a little clearer, explaining that the aim of phenomenology "is to use ... descriptions as a groundstone from which to discover underlying commonalities that mark the essential core of the phenomenon", but *GfL* was the author's first significant piece of research so the procedural clarity offered in Laszlo and Krippner's (1998) *Systems Theories: Their origins, foundations, and development* was adopted. Thus for *GfL*:

> “The starting point is consideration of the embedding context that includes, and is to some extent defined by, the phenomenon under consideration. The second step involves description of what may be defined as 'sub-wholes within the embedding whole': identifiable discrete entities existing in their own right within the larger framework of the overall ensemble. Third, attention shifts to the specialized parts within the identifiable wholes, with emphasis on understanding the structures, their compositions and modes of operation ... The fourth and final step refocuses on the embedding context, integrating the perspective obtained at each of the preceding steps in an understanding of the overall phenomenon, including its internal and external context” (Laszlo & Krippner 1998, pp.56-57).

With these broad directions in mind a flexible inquiry plan was devised. Flexibility was required so that the research process could accommodate both unforseen contingencies and constructs that would emerge from the research data (Suter 2012). To balance the flexibility that allowed exploration of emergent phenomena with the need to establish trustworthiness the inquiry plan envisaged case records as a means to develop and maintain a detailed audit trail.

3.4 Inquiry plan

Yin (2003) suggests that embedded case study designs ought to have five components, they are:

1. Questions;
2. Propositions;
3. Units of analysis;
4. Logic linking data to propositions; and,
5. Criteria for interpreting findings (Yin 2003, p.21).

GfL considers components one and two of Yin's (2003) scheme part of Laszlo and Krippner's (1998) first step and the remainder of the two approaches to be broadly equivalent. The following sections therefore discuss *GfL*'s approach to each of Yin's (2003) components with Laszlo and Krippner's (1998) purpose in mind.

3.4.1 Question

GfL's question could be put in several ways; from a nature perspective the question might be interpreted as examining how species-typical environments trigger learning (Johnson 2007b), nurture perspectives might ask how the environment conditions and reinforces behaviour and communities of practice perspectives (Rogoff et al. 1995, Rogoff 1998, Wenger 1998) might approach the question in terms of materiality's influence on children's participation in social systems. *GfL* espouses a systems perspective that offers a new synthesis of neo-Vygotskian theory, Bateson's (1972) thinking and J. J. and E. J. Gibson's (1979, 1992) ecological psychology so the key question for research is expressed as: How were primary-school student's self-chosen actualisations of affordances in a rich and diverse schoolyard related to learning? As anticipated by Yin (2003) this research question produced a series of propositions and research sub-questions that are discussed below.

3.4.2 Propositions

Different researchers and disciplines will unpack this study's key question in ways that express their ontological and epistemological assumptions. *GfL* approached the question from a perspective based on Bronfenbrenner and Morris's (2006) bioecological model but also with of proximal processes as elaborated from Vygotsky's (1934/1978, 2004), Bateson's (1972) and Gibson's (1992) work. From this position *GfL* identified the four propositions and subsidiary research questions outlined below. Procedures to ascertain answers to each question are also briefly introduced here then further described in the *Units of Analysis* section.

Proposition One: Environments influence individual choices.

Systems perspectives posit that environmental characteristics influence individual choices and behaviours (Min & Lee 2006, pp.51-52) so two questions followed for *GfL*. They were:

1. What systems configured the study site and how might they influence student's affordance actualisations?
2. What potential affordances were available at the study site?

In the contemporary literature "there is a consensus that … theory-guided selection of nonrandom cases" (Levy 2008, p.8) is the preferred means for identifying small number and single cases for qualitative research. Following this logic *GfL*'s study site was selected as an influential case (Gerring 2007, Seawright & Gerring 2008) on the basis that its grounds (the schoolyard) were specifically designed, provisioned and regulated as learning environments. To determine if they could sustain identification as influential, *GfL* undertook description and interpretation of existing data about the study site using Tytler, Symington, Smith & Rodrigues's (2008) criteria for innovative schools. Description of Deepwater's environment is introduced in section *3.4.3 Units of Analysis* of this chapter and completed in section *4.2 Part one: An ecology of schoolyard learning* of the next chapter. The descriptions are extensive in order to both justify selection of Deepwater's schoolyard as an influential case and provide the reader with a sense of the embedding environmental system in which children actualised material affordances.

The question regarding availability of material affordances in Deepwater schoolyard's mesosystem and microsystems narrowed this study's focus from broader environmental characteristics to the schoolyard activities that were available to children. Affordances are related to personal characteristics and cannot be actualised by an individual until they possess both the capacity and inclination to do so. Strictly then, affordances are neither in the microsystem nor the individual (Gibson 1979). However, in order to expose material elements that influence children's activities, Kyttä (2003) introduces the concept of potential affordances or the action possibilities that are yet to be actualised. *GfL*'s approach to identifying potential affordances used Heft's (1988) typology of affordances to apply a functional, as opposed to form-based, analysis of the schoolyard's spaces and places. *GfL*'s account of the study site's potential affordances is presented in the results chapter (section 4.3) of this study and provides the reader with a sense of the schoolyard mesosystem and microsystems.

Proposition Two: affordance actualisations are related to learning.

Converging theory and evidence indicate that actualisations of affordances in and over time are related to learning (Bronfenbrenner & Morris 2006, Chawla 2007, Fleer 2010, UNCRC 2013). In discussing communities of practice Rogoff et al. (1995, p.55) outline their interpretation of this proposition:

> "If development is seen as a process of transformation of responsibilities and understanding ... cognition need not be defined as a collection of stored possessions. ... Instead of studying a person's possession or acquisition of a capacity or bit of knowledge, the focus is on the active changes involved in an unfolding event or activity in which people participate."

GfL took a view of participation similar to Rogoff et al. (1995) but, in the language of ecological psychology adopted in this research, proposed that affordance actualisations mediated changes in perception (learning). To this end the study sought answers to the question: What schoolyard affordances did the embedded case-study students (participants) actualise?

To approach this question *GfL* undertook a review of both existing school documentation and the study's initial images/videos. The review concluded that Heft's (1988) typology adequately categorised students' affordance actualisations but indicated that interpretation of individual images and videos was less reliable than desired. Further, the review indicated that additional information would be required for identification of learning and learning processes. *GfL*'s fourth proposition emerged from this preliminary analysis.

Proposition Three: personal factors influence affordance actualisations.

Based on *Grounds for Learning's* literature review this research design proposed that students' choices of affordance actualisations were influenced by personal characteristics (Bronfenbrenner 1979, Wachs 2000). From this proposition emerged the question: What combinations of personal characteristics influenced participant schoolyard activities? Whilst thorough psychological analysis of personal characteristics was beyond the scope of this study the bi-polar dimensions of value theory (Schwartz 1992, 2010) allowed sufficient differentiation for maximum variation sampling (Patton 2002) of participants. Bronfenbrenner (1979, p.39) describes the purpose of such deliberate selection as ensuring that:

> "at least the most critical and unavoidable contrasts are represented systematically rather than left to chance. Allowing the latter to occur unheeded not only inflates experimental error but also may deprive the investigator of information bearing on the interaction of different ecological conditions."

GfL's maximum variation sampling thus sought to expand the range of information available for research. Simultaneously it also achieved a secondary aim, viz: it facilitated phenomenological description and comparison that revealed "shared patterns that cut across cases and derive their significance from having emerged out of heterogeneity" (Patton 2002, p.235). A description of how participants were selected for study follows in *3.4.3 Units of Analysis*.

Proposition Four: multiple levels of learning are related to perceiving continuities and discontinuities in affordances over time.

GfL's synthesis of Gibson (1972), Miller (2011, after Vygotsky 1934/1978, 2004) and Bateson (1972) proposed that perceiving flows and discontinuities in affordance actualisations would be related to primary, secondary and tertiary levels of learning. From this hypothesis followed two questions, viz:

1. How was learning expressed in students' affordance actualisations?
2. How did study participants adapt their affordance actualisations to allow more expert participation in culturally valued practices?

At this stage *GfL* posited that frequent video observations over an extended period of time were likely to yield information sufficient to discern learning (see Lavelli, Pantoja, Hsu, Messinger & Fogel 2006 on microgenetic observation). To achieve the richness of information that *GfL* anticipated would be required it was decided to select five students for frequent video observation over a period of one academic year. In addition to video observation, the researcher engaged participants in unstructured interviews and replayed video excerpts to participants while recording their reflections on the videoed activities. A small number of participant-made videos also contributed to the data. The large quantity of data these methods generated was chronologically ordered and transcribed (see LoGreco & Tracy 2009) and, to ensure referential integrity, case records were created. Subsequently case narratives (histories) were written and, to facilitate appropriate within and cross-case comparison, draft narratives included case record coding.

3.4.3 Units of analysis

Laszlo and Krippner's (1998, p.56) second step involves description of what are defined as "sub-wholes within the embedding whole." *GfL*'s propositions indicated that four sub-wholes were appropriate for this case study. They were:

a) The study site schoolyard;
b) Deepwater schoolyard's potential affordances;
c) Characteristics of embedded case-study participants; and,
d) Changes in student affordance actualisations over time.

Each of these sub wholes is discussed separately in the following sections.

The study site schoolyard

GfL proposed that Deepwater Primary School was an influential case (Gerring 2007). To test the validity of its selection, and following Patton's (2002, p.235) suggestion that “high quality, detailed descriptions of each case ... are useful for documenting uniqueness", this study reviewed and described denominational and school documentation related to schoolyard materiality and practices. In addition to justifying the study site selection the description also (i) provided *GfL* a means to understand the study site in its wider environment (this is presented in *4.2 An ecology of schoolyard learning*) and (ii) suggested factors that were relevant for later reading of the schoolyard “as a text " (Duncan 1985, p.137).

Deepwater is a denominational primary school that was constructed at a place of physical and cultural transition. DEA's[36] 2006 choice of Karnu Kauwe as the place to build its new school positioned Deepwater both in Kaurna[37] country between South Australia's Mount Lofty Ranges and the waters of Saint Vincent's gulf and between the expanding suburban housing developments that were replacing the post-colonial farmland which had displaced traditional patterns of land ownership and management some 160 years previously (Image 3).

Deepwater was also positioned between ideological poles. Between, for example, denominational documents that poorly reflect contemporary social thought (Grajczonek 2010) and contemporary theology which states that "every human person … has the natural right to be recognized as a free … being" (Vatican 2003, n.p.). The latter position held sway within DEA so children were constructed as relational agents and, following an education reform agenda similar to that described by Huse (1995, p.33), Deepwater was imagined as a school where children would have "the place, the time, the tools, the methods and an authentic motivation ... to discover what is the case". Or, in the words of then DEA chief executive (Salmon 2007, pp.29-30), as a place "where students develop[ed] their own authentically grounded understandings of the truths ... being disclosed in their learning."

Physically and ideologically then, Deepwater was positioned to explore the integration of systemic values, contemporary culture, everyday life and, relatedly, an innovative educational idea. A full year before opening, for example, DEA's *Education and Design Ideas for a Community Learning Centre* envisaged an alignment of ideas, practices and actors that would produce a mode of schooling "outside of anything we have seen" (MG 2006.01.24, p.1[38]). Similarly within two months of opening the school newsletter proclaimed:

> "Together, we at Deepwater are pioneers, not of anything radical but of something we believe to be good for our children as they grow in this new century. We are trying to integrate a learning environment and program that is more holistic and that balances the creative and critical and rational aspects of learning" (Deepwater, 30 March, 2007, p.1).

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[36] DEA is a pseudonym for the organisation that sponsored construction of the school and Karnu Kauwe a pseudonym for its location.
[37] Kaurna is the collective name for the aboriginal custodians of the region.
[38] Referencing of quotes from *GfL*'s case record uses author initials (pseudonyms), US convention dates and, if appropriate, page numbers or times.

Image 3. Deepwater Primary School, situated between new suburban development and post-colonial farmland that was slated for development (Land Management Corporation 2011). (Image source: Nearmap, March 2011).

DEA’s and Deepwater's pioneering approaches were subsequently acknowledged as influential when the original school building won Australasian and international recognition from the Council of Educational Facility Planners International (CEFPI) as a Project of Distinction and when the school was introduced by the 2007 Australian College of Educational Leader’s International Conference keynote speaker in the context of her presentation *New Imagery for Schools and Schooling: Challenging, Creating, Connecting*. Unsurprisingly, recognition of this type also attracted the attention of other school systems and principals who, following visits to Deepwater, subsequently modified plans for their new buildings.

Deepwater was not entirely new however, indeed the school’s position was framed in the context of powerful histories and expectations. For example, mandated state operational criteria, DEA's structures and mechanisms, reformist understandings of education, the experiences staff brought to Deepwater and established community views all meant that the school's ideas and practices could not be entirely new. As such *GfL* felt the school was, perhaps, best conceptualised as between existing and emerging, as transitional - even liminal - or, in terms of the business thinking that pervades contemporary education (McNeil 2002, Smith 2006), as innovative (Tytler et al. 2008).

Deepwater schoolyard's potential affordances

Kyttä (2003, p.20) suggests that system "components … should not be taken out of context" but Bronfenbrenner and Morris's (2006) bio-ecological model allows that individual factors may be examined separately then subsequently reintegrated (Tudge et al. 2009) so *GfL* documented two types of study-site affordances; social and material.

First, environmental opportunities for sociality were reviewed. Although the literature shows that environments are actualised for social purposes (e.g. Clark & Uzzell 2002) Kytta's (2003, p.63) addition of "environmental opportunities for sociality" to Heft's (1988) typology was problematic for *GfL*. Primarily this was due to the difficulty of differentiating how opportunities for sociality might derive from material elements that were not already described by other affordance categories. Although mindful of the difficulty *GfL* did not resolve this latter issue because observations suggested that the environmental categories originally named by Heft (1988) did indeed afford sociality. The relatively flat surface described in part one of chapter three, for example, was observed to afford visual/auditory connection and sitting together, both of which were related to sociality. This study did discern that Deepwater's schoolyard afforded sociality by reviewing existing school documentation however. Initially *GfL* noted congruences between Kyttä's (2003, p.92) "ideal representation of a child-friendly setting" and Moos's (1980) dimensions of social environments (in sheltered care and other settings). That is, Kyttä's 'extensive opportunities for children to act freely and with support' was equated with Moos's (1980) Relational Dimension. Similarly, children being agents who use and adapt their environments was equated with Personal Development Dimensions. Finally, 'an abundance of potential positive affordance's was equated with System Maintenance and System Change Dimensions. Having proposed these equivalences *GfL* then examined existing school documentation to ascertain if the dimensions of social environments were in evidence at Deepwater. The findings are summarised below.

Relationship dimensions- Content of school newsletters indicated that "individuals were involved in the environment and they supported and helped each other" (Moos 1973, p.657). For example school newsletters quoted students as reporting:

"I have lots of friends and I feel safe" (Deepwater, 26 June, 2009);

"I have many friends ... there is so much to do, everyone here is part of my community" (Deepwater, 23 March, 2010); and,

"our school is like one big family, everyone knows who everyone is" (Deepwater, 30 November, 2010)

During an informal interview a visiting education consultant was also recorded as saying:

"I actually think I see children playing when I come here. I mean, playing as in the meaning of reciprocal, engagement with each other, with communication and two-way conversations" (2010.04.09[39]).

Personal Development Dimensions- During informal interviews staff offered views about the potential for student personal development and self-enhancement. Comments verifying potential for personal development include observations that (i) older students show younger students safe ways to build cubbies, (ii) the difficult task of listening to students and "getting cues from them" (CB 2011.08.08) was a key way teachers scaffolded student success and (iii) teacher engagements with students were about making explicit the connections between individual actions and collective values/ways of knowing. By way of example a respondent discussed differences between teachers "policing" at other schools and "engaging in dialogue" (BS 2011.08.29) with Deepwater's students to scaffold constructive, respectful and welcoming relationships. Another experienced educator who observed children's recess and lunchtime activities also commented:

"I wasn't aware that what people were calling *outside learning*[40] was what we call *playtime* … it looked to me more like students engaged in some kind of learning … it could have almost been a structured … activity outdoors" (PS 2011.06.05).

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[39] Year, month and date references are to case record data gathered by the researcher during the course of this study.

[40] Henceforth *GfL* uses the term 'outside learning' in preference to 'recess and lunch'.

System maintenance/change dimensions- Again school newsletters quoted students on issues related to "order and organization, clarity and control, innovation, and small-group environments" (Moos 1973, p.658). Quotes included:

> "I like ... that you can listen to the teacher and the teacher listens to you" (Deepwater, 26 September, 2009); and,
>
> "everybody works as a community. It doesn't always happen that way. When things go wrong we have a community meeting and we resolve issues, make goals, celebrate things that have happened and share our feelings about the school" (Deepwater, 17 May, 2010, p.1).

Reports such as those above were taken to indicate that Deepwater's schoolyard afforded sociality.

Second, the study examined the schoolyard materiality and two approaches - form based or functional - were possible. Of the two possibilities form-based approaches would "consider environments independently of how they may be used" (Heft 1988, p.31) and functional approaches would examine environmental attributes relative to humans. Since *GfL* posited that student learning was related to environmental qualities the study used Heft's (1988) typology of affordances (Table 1) to deconstruct the study site schoolyard's functionality for humans (see section 4.3). Using this approach necessarily gave minimal attention to the human side of affordance possibilities. *GfL* did not ignore social elements that support schoolyard affordance actualisations however; these are discussed below and accounted for in the thesis's descriptive case-study narratives. Similarly the schoolyard's secondary and tertiary affordances are examined in the results, discussion and conclusion sections of this thesis.

Evaluating the remaining potential affordances in Deepwater's schoolyard was less problematic and served to prepare the ground for both: observation of affordance actualisations during field work; and, later reintegration in *GfL*'s case study narratives.

GfL's first move in evaluation was to deconstruct Deepwater's schoolyard as an entity using Heft's (1988) typology. These categories were: flat, relatively smooth surfaces; relatively smooth slopes; graspable/detached objects (alternatively known as loose parts); attached objects; climbable features; apertures; shelters; mouldable materials; and, water. Identifying, photographing and sometimes measuring aspects of each category was *GfL's* next step, then followed drawing maps and, finally, drafting descriptions of each category. Although several attempts were made to draft maps that reconstructed the schoolyard's potential affordances the detail required was such that only the most general renditions were legible (e.g. Figure 5, next page). Image 4 offers an aerial photograph comparable with Figure 5 and this is clearly more suggestive of the schoolyard's potential affordances. Maps and aerial images could not resolve a useful level of detail, however, nor did their Euclidean precision do justice to children's topological experience of the schoolyard. For these reasons a decision was taken to not pursue mapping of potential affordances. Instead, descriptions and images that document Deepwater schoolyard's potential affordances are presented in part two of *GfL*'s next chapter.

Table 1. Typology of schoolyard affordances after Heft (1988, p.36).

Environmental Quality	***Typical affordances***
Flat, relatively smooth surfaces	walking, running & cycling
Relatively smooth slopes	rolling down, running down, sliding down
Graspable/detached objects	building, throwing, & drawing
Attached objects	sitting, jumping off, & jumping over
Climbable features	climbing, looking out from, &, exercise
Apertures	moving through, & looking from one place to another
Shelters	microclimate, prospect, & refuge
Mouldable materials	construction, pouring, & modification
Water	splashing, mixing, & swimming

Figure 5. Deepwater schoolyard. Relatively smooth slopes (dark green) and relatively flat surfaces (other colours). White areas were indoors or out-of-bounds so were not part of this study.

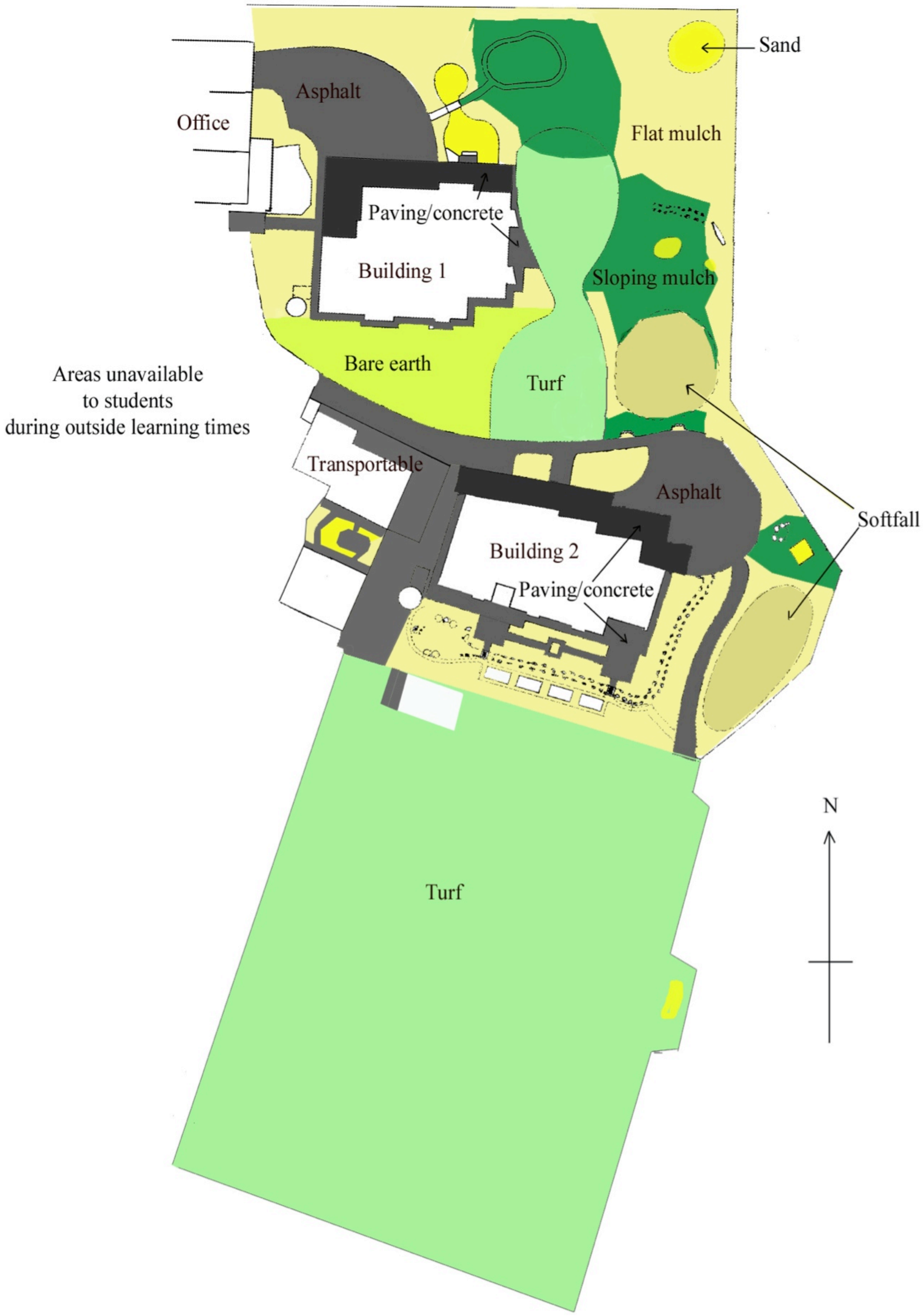


Image 4. Deepwater schoolyard. This oblique aerial image (minus part of the turf sports field) offers a sense of Deepwater schoolyard's affordance potential but specific attached objects, climbable features, apertures, shelters, mouldable materials and water are imperceptible.

Characteristics of embedded case-study participants

The study site was a fee-paying school that made its preference for collaborative outdoor activities with loose parts clear. Consequently the school's cohort can be considered a self-selected group. To overcome the possibility that very similar individuals may be unrepresentative of larger Australian population *GfL* proposed to select a small-number maximum variation sample of embedded cases from the consenting group and, for simplicity, used Schwartz's (1992) Bi-polar Value Dimensions to select participants for close observation.

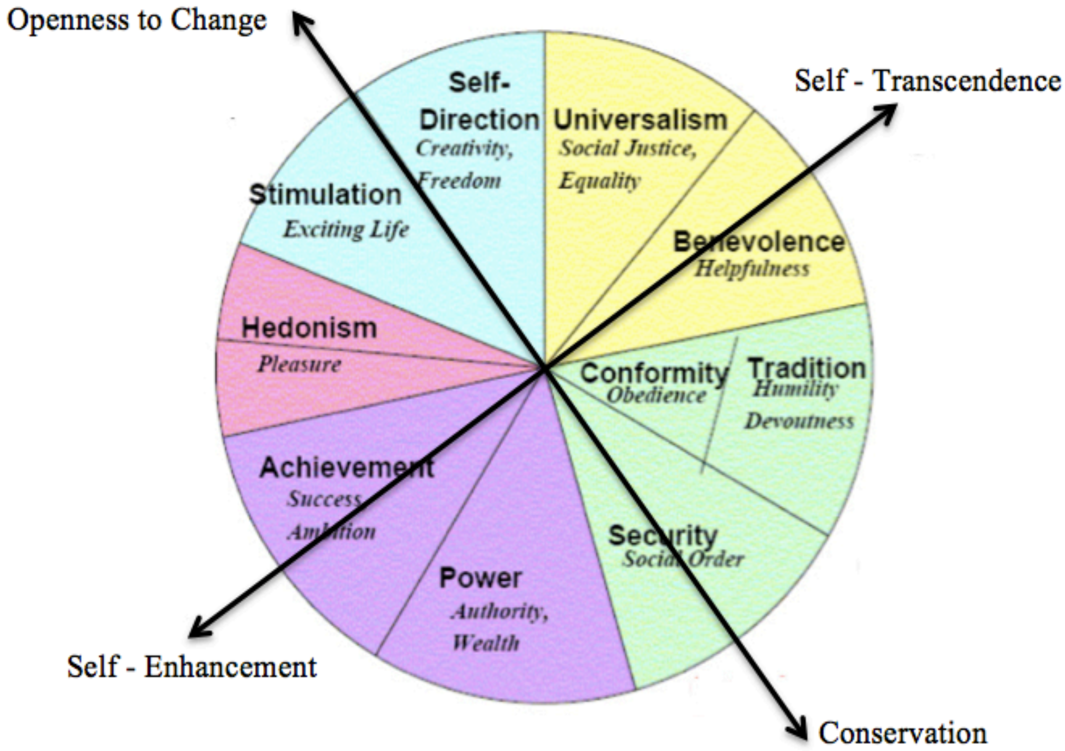
Bi-polar value dimensions

Value theory provides insights into human choices that lower-level concepts cannot (Mayton et al. 1994, Schwartz 1992, 2010). Values, for example, are more significant predictors of adult environmental behaviour than either race (Grob 1995) or gender (Schwartz 2010). Today five decades of scholarship converges to position values as:

> "beliefs ... motivational construct[s] ... guides ... [that] transcend specific actions and situations. ... [and] form an ordered system of value priorities that characterize ... individuals. This hierarchical feature of values also distinguishes them from norms and attitudes" (Schwartz 2010, p.1).

Schwartz (1992, 2010) describes ten value types which, following Guttman (1954), are regarded as circumplex (See Figure 6).

Figure 6. Value theory's circumplex relations of value types (from Schwartz 2010, p.3) overlaid with the bi-polar value priorities (Westling-Allodi 2007).



Whilst value dimensions are conceptualised as circumplex, they can also be interpreted as comprising two bi-polar dimensions. Westling-Allodi's (2007) study of values theory demonstrates that the bi-polar dimensions are applicable to learning environments and names the bi-polar dimensions as:

1. *Self-Enhancing* (characterised by a focus on power, achievement and self improvement and expressing creativity) to *Self-Transcending* (characterised by benevolence, willingness to co-operate, concern for others and willingness to value others' contributions).

2. *Open-to-Change* (characterised by self-direction and stimulus seeking behaviour, willingness share views and ideas with others, being trusted and trusting and by taking responsibility for activities and learning) to *Self-Conserving* (characterized by self-restriction, preference for order and unwillingness to change, avoidance of risks and challenges, a tendency to rely on and follow rules and a tendency to follow others. Self-Conserving people may also be organized and self-disciplined).

Although the priorities individuals' attach to particular value types are an ordered system they are affected by differences in other personal characteristics and life circumstances (Schwartz 2010, p.5). In short, experience influences personal value priorities. It is therefore unsurprising that children and young people who share similar experiences tend to exhibit similar value priorities. Colladoa, Staatsb and Corraliza (2013, p.43) find, for example, that exposure to nature at summer camp promotes US "children's emotional affinity to nature". Similarly, Malinowski and Thurber (1996) find that young people are likely to develop aesthetic appreciation of their environment after they experience spaces as affording commerce, social interaction and activity. The concept that experience influences values is also developed in *The Value of Life: Biological diversity and human society* (Kellert 1996) where taxonomic categories similar to the bi-polar dimensions are discussed. *Self-enhancement*, for example, is similar to Kellert's *Scientific Type* in that both prioritise: intellectual competence; observation; and, systematic analysis. Likewise, the *Self-transcendence - Conservation* arc close matches for Kellert's *Moralistic Type* in that each prioritises: order and purpose; protection; respect; and, shared moral convictions. Finally *Open-ness to Change* closely matches Kellert's *Naturalistic Type* in that both prioritise: pleasure; exploration; inquisitiveness; self-confidence; self-esteem and adaptability.

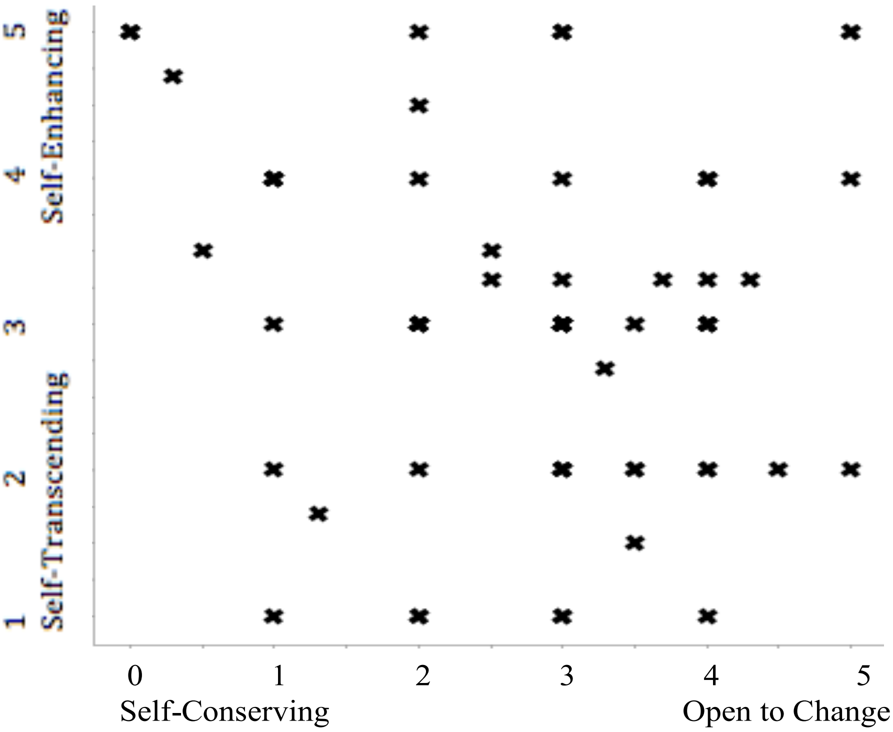
Values do not describe specific personal capacities in the manner of the bioecological model's demands, resources and dispositions but Kellert's (1996) taxonomy and Westling-Allodi's (2007) research demonstrates that values do describe how important personal attributes and environmental relationships co-vary. Given this demonstrated relationship *GfL* posits that Schwartz's (1992, 2010) bi-polar value dimensions offer a reliable means to discern maximum variation of learner-environment values.

To enable discernment of individual value priorities, *GfL* first adapted Westling-

Allodi's (2007) instrument to create two five-point Likert scales representing: Self-Enhancing to Self-Transcending; and, Open-to-Change to Self-Conserving value dimension. *GfL's* approach was a departure from Westling-Allodi's method in that it differentiated case-study students on the basis of value priorities whereas the original relates self-reported student-environment relations to Schwartz's (1992) general theory. However, in personal correspondence, Westling-Allodi (9 October, 2008) confirmed that the above adaptation was consistent both with Schwartz (1992) and the instrument she created. Having confirmed the validity of its proposal *GfL* adapted Westling-Allodi's instrument then sought student and caregiver consent to be research participants. All 180 Deepwater students were invited to participate in *Grounds for Learning* research and approximately 46 percent of students/parents (n=83) consented. Subsequently *GfL* requested that parents, home-group teachers and school leaders identify their perceptions of participating student's value priorities on each of the Likert scales. In order to exclude the possibility that self-report bias may have misrepresented the diversity of value orientation students were not asked to report value priorities. Justification for doing so was available in the literature; most recently, for example, an Ontario Agency for Health Protection and Promotion (2015) meta-review shows that self-reports of child and adolescent height, weight and body-mass are frequently inaccurate. Earlier research (Donaldson & Grant-Vallone 2002) suggests that two categories of such inaccuracies may stem from children and adolescents attempting to give socially desirable answers. Having excluded the possibility that self-report bias may have generate inaccurate responses *GfL* compared parent-reports of student value orientations with staff reports of the same, the intent being to reject all reports where a discrepancy of greater than one was apparent. No such discrepancy was found however, and an average value priority was then calculated for each participant then graphed (Figure 7) on an *x* axis representing the Self-Conserving to Open-to-Change dimension and a *y* axis representing the Self-Transcending to Self-Enhancing dimension.

Once a value priority distribution was created that included all students who had indicated a willingness to participate in the research *GfL* undertook a three-week period of preliminary observations to identify a diverse group of five students who were available and willing to have their schoolyard affordance actualisations videoed during one academic year. The preliminary observations showed that a small number (n=4) of students who consented to take part in the study's early phase were not frequent users of the schoolyard so these were not shortlisted for consideration as case-study participants.

Figure 7. Distribution of students' value priorities. (Note: for clarity this distribution does not represent the number of individuals at each point. Also, no students were described as 0 on the *y* axis so this value is not shown.)



The study also noted that new students with no experience of the study site schoolyard were enrolled each year and, because new students were considerably fewer in number than continuing students, *GfL* placed an initial priority on identifying new[41] students who frequented the schoolyard. To this end nine year-old Araceli, who was described as showing strong value priorities (4,1) by her parents and teacher, was invited to participate in the study's video observation phase.

GfL's preliminary observations were consistent with Trimble (1994, p.67) who notes that "natural places subvert [gender] rules", nevertheless the study deemed it wise to select a mix of male and female participants. Thus consideration turned to eight year-old Edward (1, 2) who had attended Deepwater since turning five and who was frequently observed in the schoolyard. Although close in chronological years Edward's different gender, value priorities and experience of the schoolyard indicated that he too should be invited to participate in *GfL*.

[41] *Microgenetic Designs To Study Change Processes* (Lavelli et al. 2006) suggests that intensive observations across periods of transition are more likely to reveal changes that occur during times of rapid development than longer-term observations across periods of consolidation. Students new to Deepwater were clearly experiencing periods of change and *GfL*'s hope was that by focusing on one or two new students relations between schoolyard affordance actualisations and learning would be revealed.

Given the similarities in Araceli and Edward's ages two further participants were selected on the basis of their age, gender and value priority differences.

School staff and parents had indicated that ten year-old Lauren (4,4) shared similar value priorities with two other students who were near an extremity of *GfL's* distribution. Of the other students identified at (5,4) and (5,5) one had declined *GfL's* invitation to participate in the study's latter phase and one did not frequent the schoolyard. Additionally, observations of Lauren's behaviour at the beginning of the school year demonstrated that she particularly wanted to become a member of a cubby-making group but that she had no obvious means to negotiate entry. From a research perspective Lauren's desire to join the group identified her as a user of potential affordances and suggested that she should be invited to participate.

Harry (3,3) was a seven year-old boy who had experienced Deepwater's schoolyard since he was an infant when his parents brought his sister to and from school. Thus, although young in years, of all the possible participants Harry had equal longest on-going contact with the school. Additionally his mother and teachers indicated that he demonstrated a balance of value priorities. Taken together these qualities suggested that Harry might serve as a median within the participant sample so he was also invited to take part in *GfL's* video observation phase.

The selections described above had accounted for each quadrant of the value priority distribution save for the self-conserving, self-enhancing quarter so *GfL's* attention was cast to the students at (0,5) and (0.5,4.75). Of these the latter had left the school and the former (six year-old Linus) was infrequently observed during *GfL's* preliminary observations. Further inquiry indicated that Linus was not inside or using the sports field during recess and lunchtimes so the assumption was made that detailed observation would make his activities visible. Linus was Araceli's younger brother, however, and in light of *GfL's* maximum variation sampling this gave cause for concern. Nevertheless, he was selected because he: occupied a unique and extreme position at the perimeter of the sample's value distribution; would be the youngest child in the sample; and, (as per Araceli) had limited experience of Deepwater's schoolyard. Although selecting both Linus and Araceli's effectively disregarded their shared home lives *GfL* did note that the inclusion of a sibling pair increased the variation of the sample as a whole.

Once five possible participants in detailed research (and three potential replacements should any of the identified group withdraw at an early stage) were identified five teachers reviewed the selections and their knowledge confirmed that *GfL* had achieved a wide diversity of research participants.

GfL's selection process aimed to identify a group of five students who showed maximum variation of values priorities. Other insights into personal characteristics were garnered using mixed methods during the study's video observation phase. These documented personal qualities that were apparent during affordance actualisations but were not intended to be comprehensive descriptions of participant's personal characteristics.

Changes in student affordance actualisations over time

Highly regarded person-environment studies based on the bio-ecological model (e.g. Tudge et al. 2009, Wong 2001, Wyver, Tranter, Bundy & Naughton 2012a) give attention to contexts that "invite, permit, or inhibit engagement in sustained, progressively more complex interaction with, and activity in, the immediate environment" (Bronfenbrenner 1994, p.1645). Within the bioecological model's theorisation, and following Vygotsky (1934/1978, 2004), *GfL* posited that students' schoolyard activities would stimulate and support learning or "transformations of student participation in cultural activities as a result of drawing on the affordances of the environment" (Booker 2010, p.41). Therefore, in addition to accounting for the "higher level contextual characteristics … [that] … act[ed] to influence the nature of the proximal environment encountered by the individual" (Wachs 2000, p.141), *GfL* closely examined the manner and composition of students' schoolyard affordance actualisations using multiple sources of data that allowed triangulation of evidence and supported construct validity and reliability. These included:

- Historical documentation created by visiting professionals, staff, disinterested peers, and students;
- Informal interviews with participants, parents, staff and professional visitors;
- Researcher video and photographic observations in the field;
- Observational notes made in the field over an 18 month period;
- Participant photography & video; and,
- Participant and teacher reflections on selected video excerpts.

The particular foci of *GfL*'s analyses were changes in students' affordance actualisations over time (i.e. in flow) so process tracing, which is a methodological tool that "focuses on sequential processes within a particular historical case" (George & Bennett & 2005, p.13), was used. *GfL* noted that the tool was particularly suited to studying "micro level intentional behaviors … [involving] the use of qualitative variables … [such as] cognitions" (Bennett & George 1997, p.17) and, where processes were unclear, that micro-correlation (Roberts 1996) could examine the explanatory sequence. **Table 2** gives an example of process tracing for one embedded case study student's activities over a half-minute period of video observation.

Table 2. Process tracing for one half minute of Harry's schoolyard activities on 2011.03.03.

Time	Case study student	Contexts	Affordance actualisations
	Harry mimics playing in a band.	A mild morning, diffuse sunlight, no wind, morning break.	
11:32:08	Harry is sitting with friends on a log. He looks and notices misbehaviour in a nearby red-rover game and, while pointing at the behaviour, reports it to me.	Older students run on the lawn. Four peers sit or stand around the eastern log. They have timber offcuts and have been using them as pretend guitars. I approach thinking that the timber is being used (against school rules) as guns.	Sitting-on-log. Visual connection affords perception-of-misbehaviour. Presence of adult affords giving-communication.
11:32:10	Harry receives communication from peer and acts on communication: initiates air guitar movements	I watch and video. Peer communicates with Harry and plays air guitar on a piece of timber.	Visual and auditory connection communication & response. 60-100cm timber offcuts actualised as pretend-guitars.
11:32:18	Views & joins in peer performance, performs air guitar movements	Two peers stand close, performing in front of Harry	Peers and timber afford coordination & synchronisation of behaviour.

11:32:36	Harry receives communication and acts. He notices videoing and turns his body 180^0 to face me. Still holds his timber as if it were a guitar. Smiling broadly begins vigorously playing the guitar while keeping time with his left leg. Three times he glances sideways noticing that his peers are also performing.	A third peer communicates with Harry, the peer turns to perform to me. Four peers also turn to face me as if the log is their stage.	Visual, auditory connection. Peers, adult, camera and timber afford performing-for-camera/adult.

GfL's large quantity of data captured the influence of environmental conditions on learning but histories of affordance actualisations and what was known about personal, environmental and timing factors required synthesising. Therefore, (following Stanley 2008), the decision was made to represent the embedded case study students' ecologies of learning as narratives (see section 4.4). Subsequently the narratives were pattern matched (Trochim 2000) with existing theory and research to develop this study's discussion. In other words, the study followed Bennett and Elman (2006, p.259) to utilise "cross-case comparison of the detailed sequential events within one or a few cases to provide inferential leverage on complex causation even when only a few relevant cases are available for analysis."

3.4.4 Logic linking data and propositions

This study was devised as a plausibility probe to test *GfL*'s novel synthesis of three established theories, it was not constructed or implemented as an empirical study. In the context of Bronfenbrenner & Morris' (2006) bio-ecological model where proximal processes, contextual elements, personal characteristics, and timing affect what affordances an individual will actualise the logic linking *GfL* propositions and data derives directly from Patton's (2002) discussion of maximum variation sampling and three existing theories. That is:

1. Maximum variation selection of participants allows the study to capture and describe the "core experiences and central, shared dimensions of a setting or phenomena" (Patton 2002, p.235);

2. J.J. and E.J Gibson’s (1979, 1992) ecological psychology posits that "learning is not ... storage, but ... the education of attention to variables that specify a to-be-perceived environmental property" (Cooper & Michaels 2002, p.101);
3. Vygotsky's (1934/1978, 2004) theory indicates that material and phenomenological elements may mediate attention to meaning; and,
4. Bateson's (1972) contention that meaning-related multi-level learning can emerge from perceptions and resolutions of microsystem and mesosystem continuities and discontinuities.

Whilst the above synopsis suggests a logical cascade *GfL*'s research, analysis and interpretation required, as Laszlo and Krippner (1998, p.12) suggest systems research would, “an intuitive element." Intuitive does not suggest formless however, and Suter (2012, p.353) elaborates that:

> "The analytic challenge for the qualitative researcher is to reduce data, identify categories and connections, develop themes, and offer well-reasoned, reflective conclusions. This is a process of tearing apart and rebuilding abstract conceptual linkages, requiring synthesis and creative insight, changing one’s 'lens' to reconstruct an interpretation, and definitely carefully documenting the process to enhance the credibility of findings."

This was the method adopted by *GfL* as it sought to trace processes of children's learning from their sources to their expressions as more expert participation in culturally valued practices.

To achieve its aim *GfL* employed the logic of related microgenetic (Lavelli et al. 2006 following Vygotsky 1934/1978) and process tracing (George & Bennett 2005) analyses. In particular the study focused on chronological "in context action segments that have coherent themes and particular orientations" (Lavelli et al. 2006, p.50). For *GfL* this meant documenting participants' affordance actualisations then reconstructing the history of in-context, moment-to-moment “procedures and strategies that children generate” (Lavelli et al. 2006, p.45) so that relations between affordance actualisations and changes in children's participation could be identified, described and interpreted through as a five-step process. That process required:

1. Auditing, describing and interpreting of the study site's environment and potential affordances to make visible the influence of the multi-level systems that

Bronfenbrenner & Morris' (2006) discuss (see *GfL* sections 4.2 and 4.3).

2. Selecting participants who represented maximum diversity of value priorities, age, gender and experience of Deepwater schoolyard to increase the likelihood that the full range of affordance actualisations was observed.
3. Observing in situ affordance actualisations over one academic year and developing chronological case records that placed participant affordance actualisations into the sequences that E.J Gibson's (1992) ecological psychology identifies as flow. This ensured that periods of change in participant affordance actualisations were identified, directly interpreted and included in the draft narrative histories of learning. Coding of draft narratives to *GfL*'s case record ensured referential validity and facilitated cross checking for consistencies and disruptions in affordance actualisations. Narrative case histories were developed from these drafts (*GfL* part 4.4).
4. Comparing narrative histories (Glaser & Strauss 1967) and pattern matching with data and theoretical propositions (Trochim 2000) ensured that meaningful learning elements emerged. These were then combined, described, related to affordances that influenced participant's activities and discussed in terms of the multi-level learning suggested by Bateson (1972) (*GfL* chapter 5).
5. Integrating and presenting a synthesis of the research and existing literature (*GfL* chapter 6).

Extracts from process tracing subsequently used in this thesis are intended to ground the discussion of identified processes using participants' words and actions. The selection of particular extracts for inclusion in later discussions is based upon their usefulness as lived examples and does not presuppose any statistical validity, indeed the diversity of examples observed by *GfL* indicates that primary affordance actualisations are characterised by multifinality (see section 4.3.11).

3.4.5 Criteria for interpreting findings

Yin (2003 & 2009) states that, whilst there is no agreed process for determining the criteria by which case study research can be interpreted, there is general agreement that case study quality can be discussed in terms of four factors; external validity, reliability, construct validity and internal validity. The following sections offer a brief précis of how consideration of these factors informed this study's structures, methods and interpretations.

External validity

The value of influential cases is well established (Yin 2009) but *GfL*'s investigation of embedded sub-cases within a single bounded case means caution should be exercised regarding the generalizability of results to other settings. Indeed, it is a contention of the current study that changes in context influence the potential for learning in that context, thus a degree of caution is called for when evaluating the study's transferability to other contexts.

A number of child-environment studies follow J. J. and E. J. Gibson's (1979, 1992) ecological psychology by conceptualising environment-related activity in terms of affordances (Wyver et al. 2012b). Implicit in the concept of affordances is the notion that perception occurs without cognitive interpretation (Kyttä 2003) but this theoretical conceptualisation poses a degree of difficulty for *GfL* in that direct perceptual learning is not immediately multi-level. This study did not propose a reconceptualisation of affordance theory but explored the plausibility of a synthesis of ecological psychology and mature neo-Vygotskian theorisations on the role of mediation in higher-level learning (e.g. Miller 2011, Stetsenko 2009). As an exploratory study *GfL* did not seek the external validity that quantitative studies pursue, rather it prioritised what Hopkins (2002) describes as internal consistency. Nevertheless, *GfL* was mindful that, in order to be "relevant from the perspective of the user of the findings" (Bailey 1992, p.30), the research should be transparent, credible and useful for the domains in which its findings may be generalised. Therefore, following Cresswell (2013), the conceptual linkages and methodological issues that emerged from the literature on learner - environment relations were made visible throughout this study.

Usefulness is a measure of external validity (Bailey 1992) and *GfL*'s literature review indicates that studies of schoolyard learning will have relevance for educators. For example, writing in *School Recess: Implications for education and development* Pellegrini and Smith (1993, p.63) explain that:

> “In both correlational and longitudinal research, children’s recess behaviour is related, in theoretically predictable ways, to both cognitive and social outcome measures … Thus, it seems to have educational value and certainly has considerable educational relevance.”

Reliability

Reliability is a measure of a study's trustworthiness (Lincoln & Guba 1985) that is usually associated with reproducibility (Yin 2009, p.40). Postmodern views suggest that studies are able, at best, to offer a partial view of any case and may not be reproducible (Richardson 1994) so *GfL*'s methods focussed on ensuring trustworthiness.

Contemporary researchers (e.g Garrett 2011, Hemming 2008, Newman, Woodcock & Dunham 2006, Stagnitti, Unsworth & Rodger 2000) indicate that visual methods reliably record children’s behaviour. Woolner et al. (2011) explain, for example, that there is:

> “developing research evidence and understanding pointing to the particular usefulness of ... photographs, maps or diagrams in supporting the elicitation of participants’ experiences” (Woolner et al. 2011, p.48).

Video, in particular “shifts our gaze, exercises our capacity to triangulate and amplifies our appreciation of the complexities of … interaction” (Walker 2002, p.119). Given the extended observation period and studies showing that video also makes “important elements of the environment … more visible” (Zellermayer & Ronn 1999, p.260) the decision was made to invite participants to review video excerpts of their schoolyard activities. Documenting participant reflections during these reviews produced detailed accounts of participants' intentions and points of view. This process also focussed researcher attention in subsequent episodes of schoolyard observation, triangulated data, and improved the reliability of the study's interpretations and findings.

GfL's primary source of data was video recordings of participants' self-chosen schoolyard affordance actualisations that the researcher made over an eleven-month period in one academic year. Some student-made videos were also included as data but, because ethical guidelines required that students give consent prior to being videoed (and it could not be guaranteed that children would only video consenting students) these were small in number. All videos were viewed and transcribed as chronological case records (e.g. Table 2). During *GfL*'s video observation phase this study also gathered data by (i) conducting informal interviews with participants, school staff and expert visitors, (ii) documenting anecdotal evidence and (iii) gathering student and teacher reflections from school newsletters and other documentation. In common with a range of authors (e.g. Clark 2005, Darbyshire, MacDougall & Schiller 2005, Hemming

2008 & Woolner et al. 2011) *GfL* viewed this mixed, descriptive-interpretive approach as an appropriate method for constructing a more complete understanding of its case.

GfL sought to enhance study trustworthiness by including teacher reflections on both video segments and draft narratives in its data. Feedback from educators who knew both participants and the study site served two main functions; first, it alerted the researcher to wider meso-system influences (e.g. in-class behaviour) and, second, it provided a context for inter-rater conversation. Inter-rater exchanges were conversations that focussed on interpretation so no attempt was made to measure agreement or disagreement but notes of the conversations were included in data for process tracing and pattern matching analysis.

During *GfL*'s research period six changes in Deepwater's leadership also had the effect of testing the study's trustworthiness**.** With each change in leadership it was necessary and desirable to engage the new leaders with *GfL*'s purpose, processes and progress and this precipitated repeated critical analysis of the inquiry. The usefulness of this process as a methodological safeguard was only realised after three such changes however, and documentation of the leader's perspectives only commenced with the fourth new leader. As with teacher reflections and feedback this data also formed part of the study's process tracing and pattern matching analysis.

Altheide and Johnson (1994) suggest that researchers' relationships with cases and the perspectives that they bring are reliability issues for some studies and this was the case for *GfL*. Previously, selection of Deepwater as a worthy case study was justified on the basis of the school being influential (Gerring 2007, Seawright & Gerring 2008). Deepwater was also selected as a convenient (Patton 2002) case because the researcher had been employed as the part-time eco-literacy coordinator at the school since it opened in 2007 and was continuing in the role during the research phases. One benefit of having close ties to the study site was a detailed insider knowledge of the case and a particular knowledge of the schoolyard’s history. It was also recognised that, whilst the participant-observer perspective could “be invaluable in producing an accurate portrayal of a case study phenomenon” (Yin 2003, p.94), the insider viewpoint introduced additional ethical, observer effect, and researcher bias issues that necessarily influenced *GfL*'s design for trustworthiness.

Ethical issues and perspectives

Achieving university ethics committee approval for insider research on children's learning was an extended process. Procedural errors were rectified with relative ease but the committee's focus on ensuring that imbalances of power did not adversely influence either student wellbeing or informed choice proved a more substantial challenge. Nevertheless, the committee reviewed and recommended amendments to the research design so that, over six months, *GfL* put in place (i) procedures and communications that made clear the separation of teacher and researcher roles, (ii) data gathering protocols that ensured participant rights and minimised observer effects and (iii) guidelines for engaging with children and their parents that safeguarded research participants.

The priority to separate researcher and teacher roles was implemented in four ways. First, all researcher communications were initiated in writing using blank or university, rather than Deepwater, letterhead. Second, meetings and conversations with students, parents and school staff were conducted away from teaching and learning spaces. Third, each meeting was prefaced with a brief recap of the *university* project. Last, immediately prior to *GfL*'s data collection phase, the denomination that established Deepwater school granted a part-scholarship that allowed the researcher to commit three days per week to fieldwork. Consequently the researcher was able to be present while case study students undertook their usual outdoor activities and at times and places that allowed for gathering of multi-level data. Further, the researcher was able to dress in identifiably different clothing and, in contrast to the usual requirement that teachers kept moving and remained visible in the schoolyard, the researcher was able to remain in one place for extended periods and observe participants from a distance. This strategy of physically distancing the observer from participants was a specific ethics committee requirement.

Whilst ethical procedures, protocols and guidelines generally served their purpose a small number of counter-intuitive challenges occurred during data gathering. One such issue arose when a number of study participants contrived to derive a direct benefit from participation in *GfL*. On several occasions these participants requested that they be photographed while undertaking their usual schoolyard activities and some even suggested that the photo be used in the school newsletter[42]. In this way the participants who made such requests used the researcher's presence during their enactments of agency to legitimise and/or verify their capacity to act, generosity or creativity and they therefore gained a direct benefit from being observed. Although such requests were undesirable the fact that Deepwater teachers regularly observed and photographed student schoolyard activities meant that, by the time of *GfL*'s research, students were conditioned to being videoed and requests to be photographed did not constitute atypical behaviour.

For *GfL*, study participant requests to be photographed were less problematic than the few similar requests from students who were not part of *GfL*. When non-participants made such requests I explained that the research was for a university project and they could not be included without prior written consent. Some students then asked for copies of the consent forms. Requests of this type posed an ethical dilemma because, on the one hand, personal approaches to potential study participants might be experienced as coercion and, on the other, not responding showed disrespect for the students. The situation was resolved when a colleague pointed out the difference between approaching potential participants and them initiating contact. The colleague then suggested that students who expressed an interest in participating could collect information and consent forms from a disinterested third party. To this end consent forms and all other documentation was kept at the school office and students who requested forms were advised to collect them from the office. There was no monitoring of whether or not students collected forms and the matter was not raised with students at a later date. This practice resulted in a total of 8 students joining the research project.

Ethical requirements insisted that only consenting children be videoed and, as research participants were free to choose whom they associated, a 100 percent response rate would have simplified data collection. The 46 percent response meant that some children had to excluded from video documentation. In practice however, the small number of children who were videoed (n=5) typically had regular friendship groups and only one child associated with a group (n=4) who had not given consent. Fortunately the children in this group were new to the study site and, when they became aware that their peer was being videoed, they sought out consent forms and became study

[42] Some students continued to express the hope of having their actions acknowledged publically despite my explaining, on each occasion, that a front-office staff member chooses the images for school newsletters.

participants. The result was that videoing was more straightforward than expected (see also 3.4.5 *Ethical issues and perspectives*).

Generally, displacing requests by allowing a process for children to join *GfL* resolved questions of coercion and avoided difficulties with students' teacher - researcher confusion. On one occasion, however, a pair of students requested that they be photographed and this led to an unexpected difficulty. The incident began when two girls requested that I photograph them and I declined by explaining the requirement for prior written consent. It then continued a few minutes later when the pair appeared behind a group I was videoing. I suspended videoing and moved to find a viewpoint that did not include the pair but, as I moved, they adjusted their position to remain in the background. Eventually I found a background of vegetation that excluded the pair but they responded by singing loudly from out of view. The pair's decision to express their power in this manner would, in my role as a teacher at the school, have caused me to engage them in conversation but instead I persisted with videoing and, at the conclusion of outside learning time, discussed the incident with the school principal. Later the principal advised that she had explained the purpose and value of research to the pair and no similar incidents occurred during this study's research phase.

Observer effects

Ethics committee approval to conduct *GfL*'s research required an overt, though at-a-distance, approach to videoing children's schoolyard affordance actualisations. This meant that, prior to or at an early stage in each videoing episode, the researcher sought consent to record participant activities. Sometimes this was achieved by asking the student directly, sometimes by non-verbal communication such as the researcher pointing to the camera and the student nodding assent and, if the participant was familiar with his/her right to decline, sometimes by assuming the participant continuing normal behaviour was an indication of consent. Study participants were therefore aware that their activities were being documented and most of the time that awareness had little influence on their behaviour. Nevertheless, the researcher remained mindful of the potential for observer effects and ultimately there were several occasions when effects that Mayo (1933) and Smith (2011) describe were observed. On one occasion, for example, Linus was so excited by his affordance actualisations that he ran six metres to request a photograph then ran back to his activity. On two other occasions Harry also changed his activity; in the first instance it was to exaggerate his performance and, in the second, his purpose was to request help. Jorgensen (1989, p.16) advises that "every effort must be made to minimize the extent to which the researcher disrupts and otherwise intrudes as an alien, or nonparticipant, in the situations studied" so my response in each instance was that of a normal adult. When Linus sought attention I gave it then moved on and, when Harry requested help, not acquiescing would have created the abnormal situation of an adult refusing a student's reasonable request so for several minutes I supported Harry to resolve his difficulty. In the main however, maintaining research-teacher differences was unproblematic and videoing student schoolyard affordance actualisations proved relatively straightforward. In this regard two causes suggest themselves. First, as Jorgensen (1989) suggests, taking a participant observer role was a means to conduct reasonably unobtrusive observation and, second, it was normal practice for adults to photograph and video schoolyard activities. In addition university ethics approval required that another adult be in attendance while video recording was being undertaken. For the purposes of supervising students Deepwater normally divided its schoolyard into three areas and, because this practice continued during *GfL*'s research phase, another adult was always present in the vicinity of the researcher. Whilst the intent of this requirement was to ensure appropriate researcher behaviour, it had the additional benefit of both (i) minimising the number of times students called upon the researcher for help and (ii) ensuring that the researcher did not feel a need to become involved in student mis-behaviour. Consequently, whilst observer effects were noticed in several video excerpts, *GfL*'s method for dealing with them by noting each instance and taking them into account during process tracing analysis and interpretation is unlikely to have influenced the direction or outcomes of research.

Researcher bias

"Preconceived notions, including those derived from theory" (Yin 2003, p.59) are known to bias the collection, analysis and reporting of case study data so *GfL* undertook four measures to ensure balance. These were:

1. Recognition and naming of preconceptions (Ezzy 2002). Prior to *GfL*'s literature review previous work by this researcher was retrieved and perspectives identified.

2. Critical examination of the literature and case. The close fit between researcher preconceptions and *GfL* was noted and examined during this study's extensive literature review. Where preconceptions were not consistent with the

contemporary literature they were adjusted (e.g. from structuralist to possibilist perspectives) and, where alternative explanations were available, they were included in this thesis so that the reader might determine reliability for him/herself. Additionally research design and justification processes subjected study site practices and materiality to critical analysis with the result that researcher and staff-member perspectives were conceptually differentiated.

3. Data analysis by process tracing. Process-tracings' close attention to sequences is known to be a "methodological safeguard against investigator-induced bias" (George & Bennett & 2005, p.24). Examples of transcription-based process tracing and microcorrelation (Roberts 1996) were also included in this thesis so that readers may make their own judgements as to reliability.

4. Monitoring of research processes by study site school leaders, outside experts and supervision by two experienced academic researchers. Monitoring ensured that data collection and analysis were rigorous and safeguarded the processes from confirmation bias. In a similar fashion review of video excerpts and draft *GfL* narratives by participants, their carers and Deepwater staff ensured the reasonableness of *GfL* interpretations.

Ultimately, although every effort was made to ensure that *GfL* interpretations and results were unbiased, it is acknowledged that the study results are researcher interpretations that may be open to different or alternative renditions. Therefore the study provides images, descriptions and discussion of the observed phenomena so that the reader may discern if the analysis and discussion meets the requirements of a plausibility probe.

Construct validity

Construct validity focuses on the selection and use of correct operational measures for the concepts being studied (Yin 2009, p.40).

GfL's literature review identified contemporary play research as an important source of theory relating proximal processes and learning but, because many of children's schoolyard activities were not expected to fit theoretical understandings of play (e.g. Pellegrini 2005), *GfL* defined the proximal processes of interest as students' self-chosen actualisations of schoolyard affordances that occurred at other than scheduled instruction times.

In terms of its study design, *GfL* followed Whitehead and Mc Niff's (2006, p.81) suggestion that "if you are looking for data to show learning processes you will look for actions that appear to show learning taking place." Consequently this study videoed children's self-chosen schoolyard affordance actualisations and chronologically sequenced them to reveal processes of learning. Importantly, because places, spaces and artefacts are "experienced and evaluated in terms of a specific purpose that an individual has for being in it" (Min & Lee 2006, p.51), this research design followed Friedman and Rogers (2009, p.31) to simultaneously remain "sensitive to the meanings participants give to their situation … [whilst also exploring] … behavior and the environment, and the interaction of the two." Sensitivity to the environment as children perceived it (not as it may have existed in some external reality) was of particular relevance for this study because embedded case study participants were accorded "recognition ... as social actors in their own right, inherently no less competent than adult respondents" (Porter, Townsend & Hampshire 2012, p.132). As with Altheide and Johnson (1994), recognition that children were active agents who brought higher-level factors to their situated learning-action possibilities was expressed in this research's adoption of "participatory approaches [that] lend themselves to research where people's relations with and accounts of space, place and environment are of central interest" (Pain 2004, p.653). These included (i) in-situ videoing, (ii) inclusion of participant drawing, writing and video documentation and (iii) participant review of data. *GfL* also recognised that individuals construct knowledge in context and that expressions of knowing vary according to the environment in which the expressions are made (Anderson & Jones 2009). Therefore, following Hart (1979), Moore (1986a) and Wake (2008) who report that children give finer grained accounts of their activities when interviewed in situ, *GfL* interviewed study participants in their schoolyard. *GfL* was mindful that a "child's notion of reality … [and the] … significance of explanations put forward by the child" (Wachs 1987, p.294) were fundamental problems when investigating children's views so the study undertook (i) chronological ordering and referencing of all data, (ii) process-tracing and pattern matching, (iii) expert review and evaluation that followed Rogoff (1998) who suggests that "the investigation of people's actual involvement and changing goals in activities becomes the basis of understanding [learning]" (Rogoff 1998, p.695).

GfL's mixed methods and participant-sensitive approaches ensured that congruencies of affordances actualisations and learning were identified, theoretical patterns were matched (Trochim 2000) and draft syntheses of these were available for Delphi technique (Patton 2002) review by school staff and domain experts. In combination these methods provided robust constructs with which to test the validity of *GfL* research.

Internal validity

Internal validity applies to explanatory studies which seek to establish that certain conditions lead to other conditions (Yin 2009, p.40). *GfL* is an exploratory probe, not an explanatory study, nevertheless key concepts related to internal validity were applied to the study's design, implementation and reporting.

Hill (1965) makes the case that internal validity requires strength, consistency and coherence in observed evidence so *GfL* ensured correct associations of learning and affordance actualisations by using process tracing methods (George & Bennett 2005). In addition the research design recognised that interpretation of behavioural intent and purpose can be problematic (Hirsch 1967) and *GfL* therefore sought out and made participant perspectives visible. Confidence that interpretations accurately represented learning was achieved by pattern matching multiple sources of data and including the perspectives of study participants and other experts. Specifically, embedded case study participants reviewed data and interpretations and study site teachers were guided through review of the original and emerging data, analysis and interpretation using the Delphi technique (Patton 2002). Teacher review of video-segments, associated transcriptions and preliminary interpretations provided feedback regarding accuracy of *GfL* interpretations. Sometimes feedback also informed subsequent observations. For example, Linus's homeroom teacher suggested that his dislocation from an habitual activity (November 7) may provoke a transitional phase so the frequency of video observation was increased to twice daily.

Piantanida and Garman (1999) equate internal validity with truthfulness so, to determine if its data and interpretations rang true, *GfL* sought outsider reflections on the reasonableness of study portrayals. Feedback from educators and academics confirmed an alignment of study interpretations with outsiders' experiences and understandings of the existing literature. Expert review of *GfL* data was undertaken as opportunities arose after the research phase (between 2012 to 2014). Input was received from two Ph.D. qualified individuals, reviewers of three papers (one academic and two professional), participants at three professional conferences who had attended sessions on *GfL* and from teachers who attended more than a dozen workshops.

3.5 Research scope

GfL's inquiry sought to document and analyse the influence of material environments on children's learning. To achieve its aim the study gathered data about the contexts of student activities using existing documentation (Table 3) and by de-constructing the schoolyard in terms of affordance potentials. For the purpose of process tracing *GfL* also documented students' moment-to-moment and day-to-day self-chosen schoolyard affordances actualisations across one academic year. In Edward and Harry's cases data - gleaned from school newsletters and teachers' learning programmes (that were published before to the commencement of this research), participant reflections and teacher/parent recollections - extended the chronology of process tracing into both children's early years of schooling.

Table 3. Summary of data discussing the innovative environment. The majority of exo, meso and macrosystem data came from existing sources.

System level	Data types	Data Sources
Macrosystem	Published texts, plans & policies.	Denominational body, governments, academia & United Nations.
Mesosystem	Plans, policies, reports, minutes & personal communications.	Denominational body's regional unit, SA Dept. of Education & professional organisations.
Exosystem	School policies & newsletters, interviews & anecdotal evidence, textual analysis, notes & personal communications.	Deepwater Primary School students, parents, staff & schoolyard.
Microsystem	Photographs, videos, field notes, interviews, audio recordings & personal reflective journal.	Deepwater Primary School students, staff & schoolyard. Researcher recollections, notes, emails and observations.

In Australia the primary school academic year usually begins in late January (summer) with an eleven-week term, it pauses for a two-week holiday then continues into winter with a ten-week term. Following another two-week holiday the third school term (ten weeks) runs into spring. The last school term (of nine weeks) is again preceded by a two-week holiday then ends with a five-week summer break. In the period of this study (2011) Deepwater's academic year (minus public holidays and 'pupil free' days that were set aside for teacher professional development) comprised a total of 194 days. This researcher was a part-time teacher at Deepwater during this time and was present in that role at the study site for eighty days. Although the majority of teaching days included spending time in the schoolyard, maintaining discrete teacher and researcher roles meant that no video observations were undertaken on those days. This researcher was present for an additional 109 days that were dedicated to videoing student affordance actualisations during the thirty-minute morning outside learning time (11 to 11:30 am) and the forty-minute afternoon outside learning time (1 to 1:40 pm). Also undertaken on these days were informal interviews and gatherings of student and staff reflections on video segments.

Video segments, interviews and reflections were transcribed and annotated for process tracing (e.g. Table 2) as soon as possible after each recording and all transcriptions became data for process tracing. Insights gained from observation, transcription and annotation informed subsequent fieldwork and were the subject of ongoing review by students and teachers. For example, when observations suggested that Araceli may have been beginning a new activity phase (August 11) review by Araceli's teacher confirmed observations of a new social interest and so videoing focused on her for twelve consecutive outside learning periods.

Planned reviews of data, process tracing and preliminary findings were undertaken by two teachers and two school leaders at six and twelve months. Additionally, participants and their parents undertook reviews of the draft and final case-study narratives in 2012 and 2013. Reviews by disinterested professionals and academics occurred when all data was gathered and preliminary findings were available in the years 2012 to 2014. The thesis was submitted for examination in December 2014.

3.6 Synopsis

Grounds for Learning selected a systems-compatible qualitative research methodology to scaffold extensive periods of field observations, data analysis and interpretation. The methodology incorporated a mix of tools and techniques that made visible multi-level environmental elements, personal characteristics, situated meanings and times and timings. The initial research design was refined and elaborated during the five and a half years between beginning this study's literature review and completion of data analysis and, whilst data collection progressed largely as had been anticipated and approved by the supervising university ethics committee, interpretation required some adjustment. Initially *GfL* had hoped to identify causal relations linking experience of affordances with learning but the observed multifinality of learning did not sustain such interpretations. Consequently, *GfL* revised its data analysis categories using a synthesis of three existing theories. One result was that study findings were not directly comparable with other theories or studies although, when congruencies and differences occurred, these were used for pattern matching and to test the validity of study interpretations. Participant and expert review of emergent interpretations and final results enhances confidence that the study findings will prove useful however, and the following chapters offer expositions of *GfL* data, analysis and results so that readers may ascertain for themselves the truthfulness and usefulness of the study.

4 Results

"Though it was a little park, it held within its borders of old tall trees, notched with our names and shabby from our climbing, as many secret places, caverns and forests, prairies and deserts, as a country somewhere at the end of the sea ... and though we could explore it one day ... from end to end ... yet still the next day, it remained as unexplored as the Poles ..." (Thomas 1992, p.17).

4.1 Introduction

Dylan Thomas's recollection of his childhood park emphasises the many-layered phenomenological nature of children's emplaced experiences - experiences that even the most exhaustive studies can only hope to glimpse. *Grounds for Learning's* aim is to discern and document the diversity of children's schoolyard experiences as they relate to learning processes; the study does not seek empirical validity however, for, as Thomas points out, experiences appear, transform and re-emerge in endless flows. This study also serves a second purpose; an academic end that ultimately requires an interpretation of children's schoolyard learning. Prior to this, the complexity of learner-environment relations and the study's aim of presenting an emic view, necessitates an exposition of individual case study elements. This chapter therefore presents the results of *GfL*'s research in three sections. First, the study's justification for selecting Deepwater Primary School as an influential case is presented; this is *GfL*'s means to describe and interpret the macrosystem, or holding environment, in which schoolyard places, spaces and artefacts were actualised. Second, schoolyard "sub-wholes within the embedding whole" (Laszlo & Krippner 1998, p.56) are deconstructed using Heft's (1988) affordance typology. This process entails what Meinig (1979) discusses as reading the landscape but which will be familiar to others as descriptions of potential affordances. In this, *GfL*'s descriptions resonate with Csikszentmihalyi and Rochberg-Halton's (1981, p.91) observation that "things … tell us who we are … we learn about ourselves from objects, almost as much as from people." The third part of this chapter focuses more closely on how affordance actualisations are related to learning. It presents five participants' histories of self-chosen affordance actualisations as narratives that were enacted in Deepwater's schoolyard across one academic year. Later these descriptions serve as a basis for discussion and synthesis of how schoolyard affordances combine and recombine to support learning processes.

As discussed previously, rendering maps and images at a scale that allowed identification of individual potential and actualised affordances proved elusive for *GfL*.

Nevertheless, the following aerial photograph is presented so that readers may have some sense of the relative locations for each element and alphanumeric notation used in this chapter references this image's grid.

Image 5. Deepwater schoolyard - aerial view. Note: *GfL* did not research the influence of activities undertaken on Deepwater's sports field, the northern extent of which is visible here from H, 20 to U,20. For more complete overviews of the study site see Image 3 or Figure 5. (Source: Nearmap)

4.2 Part one: An ecology of schoolyard learning

> *"The perceiving of an affordance is not a process of perceiving a value-free physical object to which meaning is somehow added in a way that no one has been able to agree upon; it is a process of perceiving a value-rich ecological object"* (Gibson 1979, p. 140).

4.2.1 The holding environment

Pellegrini, Symons and Hoch (2004, p.1) state that "a thorough explication of aspects of the contexts in which the behavior is embedded…[is]… an indispensable part of all description of behavior" so this section introduces Deepwater schoolyard's macrosystem through an exposition of the study site as an influential case. The description draws on documentary and material evidence (Table 3) gathered during the researcher's six-years as an insider at Deepwater and seven months of observations that preceded detailed video documentation of embedded case study students' schoolyard affordance actualisations.

Justification for selecting Deepwater as an influential case used the Australian School Innovation in Science, Technology and Mathematics (ASISTM) criteria so this section is structured using the six ASISTM fields. They are:

1. "The [educational] ideas being explored/promoted;
2. The actors recruited in support of the project;
3. Practices that support the new alignment of ideas/actors;
4. Intended and actual outcomes;
5. Sustainability of the innovation in some form; and,
6. Transferability of the ideas and practices beyond the local site" (Tytler et al. 2008, p.9)

To progress this thesis three key educational ideas that Deepwater expected would influence students' outside learning are identified then an exposition of each is developed through the remaining five ASISTM fields. Those key ideas are:

1. The physical environment can be an educative agent;
2. Liberating student agency enhances learning; and,
3. Adult support could enhance schoolyard affordance actualisations.

4.2.2 Idea one: the physical environment can be an educative agent

Deepwater's foundation principal was profoundly influenced by her experience of the early childhood education that the Italian municipality of Reggio Emilia sponsors and Reggio Emilia ideas influenced the formation of Deepwater. Led by its principal, Deepwater aimed to animate several Reggio Emilia ideas (Deepwater, July 10, 2008) including conceptualisations of children "as strong, powerful and rich in potential and resources" (Rinaldi 2013, p. 15) and “space as a key source of educational provocation and insight … [which draws] … deeply on how young children perceive and use space to create meaning” (Strong-Wilson & Ellis 2007, p.40-41). Maxwell (2007, p.230) summarises the Reggio Emilia notion of space as an educational resource:

> “The ability to interact competently with the environment is an important basis for learning and the physical environment can be thought of as a ‘third teacher’ (following parent and teacher). In other words, children learn from interactions with their physical environment and from the people in their daily lives. The physical environment also provides the type of learning opportunities that Vygotsky (1934/1978) refers to as scaffolding. When children are presented with opportunities and challenges at the outer edges of their current skill levels, they are encouraged to use these challenges as scaffolding, or ladders, to reach a higher level of functioning.”

Deepwater’s foundation principal left the school in 2010 but a review of school priorities that was undertaken by seven staff in 2011 strongly aligned with the original Reggio Emilia inspired vision of space as an educative resource. For example, a school publication from the period reports that:

> “Deepwater's environment embodies the beliefs and values of those who live and learn here. Every space has identity and purpose and this means that our beliefs and values can be inferred from the material form of the learning community. Dewey (1964) said that “we never educate directly, but in-directly by means of environment” so we give our learners permission to be active co-constructors of their environments” (Deepwater 2011, p.1).

Similarly, an end of year email from Deepwater's new principal emphasised that indoor and outdoor environments were intended to communicate school values:

> "At Deepwater we, the educators, often discuss and focus on the importance of the

environments we create inside and outside and the links between them. The places we create in our environments speak of strong and competent children, of welcome and respect, and they enable construction of learning. It is often the little things that we do and the way we present places that speak volumes of our values" (Email to Deepwater staff, 15 December, 2011).

Actors

Deepwater's buildings and furnishings were designed and maintained as educational resources (Deepwater, 30 March & 8 July, 2007) and the schoolyard itself was intended to scaffold learning about the sort of “cooperation, ownership, belonging, respect and responsibility” (Malone & Tranter 2003b, p.289) that studies of other schools note. Therefore, whilst Deepwater accepted 20th Century fears regarding children’s safety in public spaces, the school also acknowledged suggestions from authors the calibre of Kellert (2005, p.54), Emeritus Professor of Social Ecology and Senior Research Scholar at Yale University, who advises that “nature offers a powerful, emotionally charged, and intellectually stimulating source of imagery” for learning. Awareness of views such as these encouraged the school to (i) conceptualise schoolyard revegetation as a means to deliver educative goals and (ii) suggest that “a growing body of evidence show[s] that children benefit from being in, playing in, and learning in nature” (Deepwater 2008, *Why Nature*, p.4). Additionally, the school prioritised “nurturing and caring for the environment” (Deepwater, 8 December, 2009) by using indigenous vegetation and, because this aligned with government and Landcare Australia objectives, financial and technical support was available from these agencies.

Images 6 a & b. Environment as teacher. a) August 2009, half wine barrel gardens (G,10) ensure that each homeroom allows “children to view and focus on small sections of the environment” (CEFPI 2008, p.7). b) By November 2010 native trees, shrubs and grasses partially enclosed the schoolyard’s central lawn (K,3).

Practices

Deepwater consciously constructed the physical environment at its greenfield site with learning in mind. For example, documentation from before building began at the site indicates that:

> "the strong relationship between space and pedagogy [was] the focus of debates amongst the members of the Education and Building Group" (CEFPI 2008, p.6).

The relationship between space and pedagogy was clearly intended to be a supportive one and other school documentation indicated that the relationship included both naturalised outdoor places (Deepwater, 22 September, 2008) and a pedagogical focus on outside learning (see *Ideas 4.2.3* and *4.2.4* below). Following Titman (1994) Deepwater therefore aimed to provide naturalised schoolyard places for "doing", "thinking", "feeling" and "being" (Deepwater 2007, *Draft Grounds Policy*, p.3).

Naturalising the schoolyard by re-vegetating with local indigenous plants began in 2007 but Deepwater understood the desired effect would take time to achieve. To support student activities in the interim Deepwater provisioned its schoolyard with natural loose parts including logs, branches, stones and sand. In addition the school provided objects such as straw bales and cloth for student use. Deepwater continued its practices of revegetating the schoolyard and provisioning it with loose parts into and beyond the period of this study.

Image 7. Deepwater students use loose parts for construction. This cubby had various forms and numerous owners over the extended period of this study (M,2).

To animate its conceptualisation of children as capable and competent agents Deepwater encouraged every student group to initiate and deliver collective projects that would enrich the schoolyard. Consequently, in the first year after opening, school students suggested and developed frog (C,6) and butterfly (D,12) habitats, a copse of closely planted trees (I,4) and a native flower garden (D,9). Student-initiated projects continued in subsequent years and later documentation explained the educative purposes guiding student involvement in place making:

> "By developing the garden through processes that accommodate children's inquiry we aim to create a significant play place, affirm that children are part of the natural & cultural environment [and] validate individual efficacy" (Deepwater, 17 February, 2010).

Student documentation from the period indicates that educator goals were at least partially achieved. For example, student-made texts and images record children's sense of achievement and happiness with their involvement:

> "I think the friendship garden (D,9) is good because all the art work we have done and the tepees. It didn't come out the way I wanted it to but the way it is now it is awesome because of the plants. We are putting more plants in every week. The friendship garden is good because people are going in the friendship garden and sitting in the tepees" (9 year-old student, April 15, 2009).

> "I go into the friendship garden every Thursday. I think the friendship garden turned out really good because we have been looking after the plants by watering them with the hose (10 year-old student, April 15, 2009).

Image 8. A student's rendition of how she expected the "friendship garden" to mature. (JT 2009.04.15).

Motivated by its idea that the naturalised schoolyard could be an educative agent, development of outside places at Deepwater continued and a distinctive style of landscaping and student activity emerged. Clusters of large wooden pots (totalling nineteen) and garden beds (totalling seven) were placed, for example, so that they could be seen and accessed from homerooms[43]. Additionally, the schoolyard was planted with almond (G,11) and stone fruit (D,16) orchards and a productive vegetable garden (M,18). Students were also involved in envisioning and naturalising the schoolyard and their input was eventually expressed in a variety of forms. Providing flowers became a focus from the school's second year, for example, and in total seven permanent flowerbeds were maintained. These contained a variety of indigenous and exotic species including native and Asiatic hollyhocks (*Lavatera maritima* and *Alcea sp.*), lavender (*Lavandula angustifolia* var. Egerton Blue) and salvia (*Salvia sp.*). Smaller flowering indigenous plants (e.g. *Lotus australis, Goodenia albiflora* and *Chrysocephalum apiculatum*) were also dispersed across the schoolyard, as were flowering trees such as crab apple (*Malus sp.*) and banksia (*Banksia marginata*).


Images 9 a & b. Students planted flowers near their homerooms. a) Sage, strawberries and marguerite daisies adjacent the nine to twelve year-old students' homerooms (M,17). b) Stocks in raised beds that doubled as seats adjacent the six and seven year-old students' homerooms (J,9).

Deepwater also extended projects where students imagined and planted out spaces to create naturalised schoolyard places. In 2008, for example, five and six year-old students added to the small copse of trees on an earth mound outside their homeroom (I,3) and students, teachers and parents elaborated the project over the subsequent four years (Image 10).

[43] 'Homerooms' is Deepwater's term for what are usually referred to as classrooms.

Image 10. Deepwater's forest-meadow in 2009 after students had planted islands of seedlings. Their intent was to create spaces and places for running, hiding and constructing (O,4).

The environmental focus at Deepwater also extended to attracting small animals into the schoolyard and this was achieved by growing host plants and habitat. For example, narrow-leaf cotton bush (*Gomphocarpus fruticosus*), a known host plant for the Wanderer or Monarch butterfly (*Danaus plexippus*), was grown adjacent to the younger children's homerooms (L,8) and wallaby grass (*Danthonia sp.*) was grown on a north-facing slope to provide habitat for small lizards (K,3). Structures such as bird feeders (I,10) were also provided to encourage small animals to habituate places where students could encounter them.

Images 11 a & b. Searching for and finding small animals. a) A student shows a ladybird *(Harmonia conformis* Boisduval) she found (R,16). b) Looking for frogs (*Limnodynastes tasmaniensis*) (D,7) was an accepted outdoor activity at Deepwater.

Outcomes

Deepwater's physical environments were conceived in the belief that "learners' competencies and motivation … [could] … be enhanced or inhibited by the setting" (CEFPI 2008, p.6) so the schoolyard was "designed to stimulate as well as support learning" (Deepwater, 16 March, 2010, p.3). In addition, outside learning places at Deepwater were naturalised because it was believed that:

> “direct experience of nature … extends to the child the possibilities of uncertainty, risk, and failure. These realities necessitate adaptation and problem solving as well as the need to construct solutions and to think critically, all of which … [are] … essential to lasting learning and maturation” (Kellert 2005, p. 86).

Deepwater's ongoing efforts to naturalise and animate schoolyard learning were consistent with the literature (e.g. Malone & Tranter 2003a) and considered by students, staff and experienced visiting educators to be supportive of learning. Following her review of Deepwater at the end of the school’s first academic year H. McDonald, chair of the Non-Government Schools Registration Board (NGSRB), noted, for example:

> “the attractive and distinctive design of the building and grounds facilitates children’s learning in many ways … and the obvious enjoyment and engagement of the children is quite unlike that seen in more traditional school grounds” (H. Mc Donald, personal communication, December 2007, p.1).

Three years after the NGSRB review the school newsletter described finding physical traces of student learning in Deepwater's schoolyard:

> “As we walked around in the quiet of after school I couldn’t believe how much we noticed – there were signs of the children’s learning … everywhere. Under bushes we found cooking areas, in secret places we found homes for small creatures, a cubby built flat on the ground looking up to a Sheoak, a geology area with rock breaking and colour making, a pottery area and so much more” (Deepwater, 3 May, 2010, p.1).

An experienced principal from New South Wales, who visited Deepwater as part of a fact-finding tour prior to re-development of his own school, also reported that:

> "The inclusion of outdoor learning spaces for students' ongoing learning [was] admirable. Learning was a day long journey with all learners, young and old, encouraged, welcomed and enticed into an environment that was focused on real and meaningful experiences" (D. Poppa, personal communication, September 4, 2011).

Reflections such as these indicate that both children and adults considered that Deepwater's outdoor spaces and places were supportive of learning. Evidently then

Deepwater's practice of designing and developing outdoor spaces as educative resources with children produced what, for its time, was a distinctive schoolyard (e.g. Images 12a & b). Additionally, even in the early stages of its evolution, there was some evidence that the schoolyard had influenced students' behaviour and sense of self-efficacy. For example, the practice of encouraging students to grow flowering plants had two effects. First, it provided access to resources (loose parts) that afforded decoration and construction (Image 12a).

Images 12 a & b. Resources and cultural schemas encourage creation of artefacts and places. a) Young students actualised moulding and flower's aesthetic affordances to stock this counter with 'sand cakes' (G,14). b) Older students actualised affordances for building to create places for imagination and sociality (D,9).

Second, it allowed students to imagine other possibilities and act to achieve them. For example, Tracey, the student pictured in Image 13a, brought sunflower seeds from home, planted and cared for them then expressed feelings of mastery similar to those Schunk and Usher (2012) discuss when she was proud to be photographed with the flowers in bloom.

Images 13 a & b. Agency in the schoolyard supports feelings of self-efficacy. a) This student brought sunflower seeds from home, planted them near her homeroom and cared for them until they bloomed (H,9). b) Flowers are an integral part of this student's perfume making activity.

Similarly, by the time of this study, the forest-meadow that students began planting in 2009 (Image 10 & Image 14) had grown to become a favourite place for both enacting games of chase and constructing cubbies. Teachers reported that the children who designed and planted the forest-meadow also felt a sense of ownership and pride.

Image 14. Deepwater's forest-meadow in 2011, a preferred place for games of chase and cubby construction.

Sustainability

Malone and Tranter's (2003a)[44] study of a forested schoolyard cautions that physical and ecological degradation is likely when the carrying capacity of naturalised places is exceeded. Although the resources that characterised Deepwater's schoolyard were robust and could be expected to survive occasional periods of neglect, examples of over-use were emerging. For example, a once-popular climbing and cubby-building tree (B,3) had been so denuded of lower limbs that it was virtually ignored by Deepwater children. On-going monitoring and maintenance is therefore likely to be required in order to ensure that increased student numbers do not overshoot the schoolyard's carrying capacity.

Sustaining Deepwater's schoolyard as an environment that communicates school values and supports learning requires both innovative cultural practices and material resources and evidence to date suggests that Deepwater will be prepared to continue its commitment to the concept of an environment as a teacher. For example, in July 2010 the school's brief for a new building (Deepwater 2010, *Plan Brief*, p.18) stated that:

> "all aspects of wellbeing and the development of positive culture are significantly influenced by what is offered to children as part of their outdoor environment. Deepwater will not compromise in this area; our research has led us to strong convictions that gardens, variety of spaces, variety of challenges, openness as well

[44] Aside from this study *GfL*'s literature review found no research discussing schoolyard carrying capacities; mandated area per-head information was common however.

as quiet reclusive (sic) areas [and] aesthetically pleasing environments all contribute to healthy imaginative, social, emotional, academic and physical growth."

Additionally, given the positive feedback staff have received from visitors regarding the schoolyard, Nature Play South Australia's[45] new campaign to promote outdoor activity and the South Australian Government's commitment to build twenty new outdoor learning areas in the coming four years (Rankine 2014), the indications are that Deepwater's staff and students will remain cognisant of their schoolyard's educative potential. The schoolyard, which itself "gives children opportunities to reflect on and evaluate their own and other children's work and ideas" (Turner & Krechevsky 2003, p. 43), will also continue to communicate the values and ideas of those who co-created it and these are also likely to sustain its evolution.

Transferability and summation

Since Deepwater opened and began its development of a naturalised schoolyard the Australian institutional context has changed or, indeed, returned "to an earlier pedagogical approach [where] the schoolyard [was] viewed as a curricular resource" (Moore 2006, p.88). For example, the Commonwealth of Australia's (2010) *National Quality Standard for Early Childhood Education and Care and School Age Care* mandates children's access to naturalised environments and the South Australian Department for Education and Children's Services (DECS) *Early Childhood Outdoor Learning Environments: Vision and Values* statement indicates that early childhood outdoor environments should offer "a diverse range of play experiences" (DECS 2010b, p.2). Even new national playground safety standards preface their requirements with a statement about the need for balanced risk in play provision (Standards Australia 2014, p.6). From an institutional and policy perspective then, it would seem that Deepwater's provision of a naturalised, educative schoolyard is transferrable. Further, indications suggest that education practitioners also believe elements of the naturalised schoolyard could be transferrable. For example, after her visit to Deepwater the director of an independent early learning centre wrote:

[45] Nature Play South Australia was launched February 26, 2014 (DEWNR 2014) and followed the four year-old Western Australian model.

> "We loved seeing your environment … you have created such a unique setting for learning … I can only imagine that all the visitors last night were as enriched as we were by the experience" (quoted in Deepwater, 17 May, 2010, p.3).

Similarly the director of a Sydney-based non-government organisation visited Deepwater in 2010 and afterwards shared images of the school with educators in New South Wales. Later she reported positive responses from educators:

> "I took over 100 digital photos in the hour or so that I was at the school and over 90% were of the grounds … feedback that I have received from educators who have seen a few photographs of the grounds … [is that the photographs have] … shifted their perspective about what 21st Century learning means and looks like" (J. Remond, personal communication, August 17, 2010).

Deepwater was not the first school to conceptualise a naturalised yard (e.g. see Moore & Wong 1997), nor was it the first to propose that the environment could be a teacher (e.g. see Gandini 1998), but innovation is more than being first, it is the purposeful combination of "ideas and practices and actors … to produce something that is new" (Tytler et al. 2008, p.19). In this regard, feedback from academics, architects, educators and policy makers indicates that Deepwater's schoolyard presents new possibilities for reimagining schoolyards as educative resources; in this sense then, Deepwater's idea that the physical environment can be an educative agent is influential.

4.2.3 Idea two: liberating student agency enhances learning

Deepwater's denominational views posit that every person is a free, responsible being (Vatican 2003) and contemporary educational theory establishes learning as a constructive, situated and social activity (de Kock et al. 2004) so Deepwater sought to explore the idea that students could be agents-in-context who experienced learning as active co-creators of meaning. With this goal in mind, and following the adventure play movement (see Kozlovski 2008, p.172 and Ward 1961), Deepwater conceived children's schoolyard activities as a means to liberate activities that prioritised ethical collaboration, individual responsibility and active engagement.

Actors

The available evidence suggests that Deepwater promoted school values and student learning by addressing both teacher pedagogies and children's activities. Deepwater's favoured pedagogy was broadly based on inquiry as processes that prioritised “*how* we arrive at a place of learning, … being actively involved in our learning and inquiring into our own questions” (Deepwater, 22 September, 2008, p.4). Students’ sense of having an authority to act was developed through inquiry and was expected to be expressed in children's habits of mind (e.g. see Marshall 2006), use of language and participation in the learning community.

In terms of schoolyard affordance actualisations, Deepwater anticipated that effective teacher practices and liberation of student agency would coincide with, and be visible in, children's known preference for construction activities (Mergen 2003). This aim was supported by adults naming and modelling "welcoming, respectful and constructive" (Deepwater 2013, *Important Uniform Information*, p.1) dispositions as guides for liberated agency. It is this insider's interpretation that the three dispositions prioritise openness to otherness, acceptance of otherness on its own terms and willingness to respond positively to the other.

Practices

Two practices characterised Deepwater's efforts to enhance student authority. They were (i) the introduction of inquiry pedagogies and (ii) authorising and celebrating student agency. (A third practice is discussed separately as an idea in section 4.2.4 because it was specifically intended to change how adults interacted with children.)

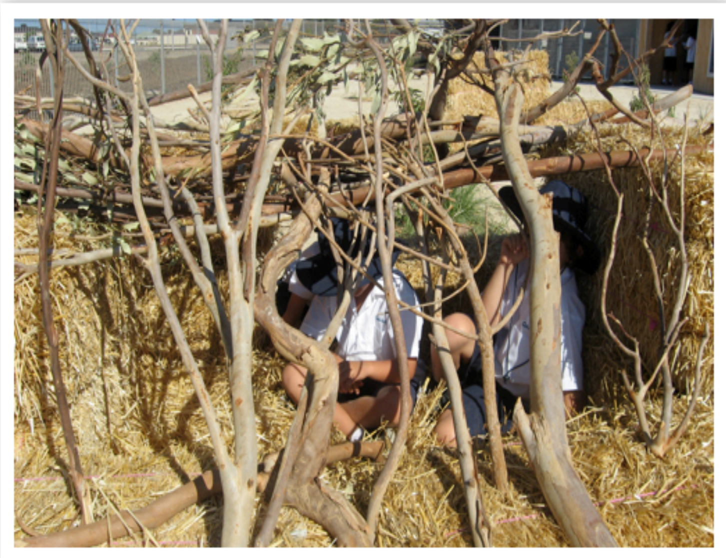
In 2008 staff were introduced to inquiry processes that were broadly based on Wiggins & Mc Tighe’s (2006) *Understanding by Design*. Documentation from the period indicates that teachers were encouraged to support learners to (i) think critically and reflectively, (ii) investigate and respond to their world and (iii) explore their creative capacities (Deepwater, 8 December, 2009, p.7). Later descriptions of inquiry processes also represented learning as a rhythm and a “mutual quest for understanding … [and] … new meaning” (Deepwater, 11 June, 2011, p.2). As such, inquiry was positioned as a pedagogical stance and also as a liberating, relational act. In this Deepwater's construction of inquiry closely coincided with a summary of Laevers (n.d.) *Ten Action Points* that was also shared and discussed with staff (Table 4).

Deepwater's inquiry focus extended to self-chosen schoolyard affordance actualisations and translated into allowing children to trial new schoolyard practices. Staff were invited to reposition their engagement with children during outside learning times as a pedagogical issue, for example, and this meant that children were accorded a

Table 4. Ten Action Points (Laevers n.d., p.2)

1. Rearrange the classroom in appealing corners or areas
2. Check the content of the corners and replace unattractive materials by more appealing ones
3. Introduce new and unconventional materials and activities
4. Observe children, discover their interests and find activities that meet these orientations
5. Support ongoing activities through stimulating impulses and enriching interventions
6. Widen the possibilities for free initiative and support them with sound rules and agreements
7. Explore the relation with each of the children and between children and try to improve it
8. Introduce activities that help children to explore the world of behaviour, feelings and values
9. Identify children with emotional problems and work out sustaining interventions
10. Identify children with developmental needs and work out interventions that engender involvement within the problem area.

degree of freedom to manage risk. A tangible expression of liberation was that students and teachers were invited to develop (or purchase) and use resources to support experiential education. Accordingly, and in short order, resources including a diversity of fixed objects (e.g. barrels, logs and tables) and loose parts that students could use and modify (e.g. containers, crates, fabric, pipes, pots and pans, sticks, straw bales and water) were installed in Deepwater's schoolyard.



Images 15 a & b. Liberated use of fixed and loose parts (March 2007). a) Children nestle inside a cubby constructed from straw bales, cardboard and branches (I,10). b) Attached objects in what had been a treeless wheat paddock (M,7).

Outcomes

The liberating outcomes that Deepwater crystallised are described in parts two and three of this chapter but a key outcome can be summarised as the creation of a child-centred microsystem that a school newsletter suggested would:

> "continue to look different because we will keep negotiating, planning and developing it with the children" (Deepwater, 8 June, 2007, p.1).

Children also commented on Deepwater's relative freedom; for example, three years after the above another school newsletter quoted a twelve year-old old student's reflection on his experience of schoolyard freedom:

> "At outside learning time[46] we kids have loads of opportunities in what we want to do. We can play soccer ... make a cubby house, play chasey and a lot more" (Deepwater, May 17, 2010, p.3).

The child centredness of Deepwater's schoolyard was also evident in conceptualisations of risk as potentially beneficial. School staff were aware that naturalised schoolyards could positively influence safety, for example, and responded in like terms when visiting teachers and school leaders questioned how children were kept safe in Deepwater's schoolyard. Awareness of risk as potentially beneficial was also communicated to the school community on the front pages of its newsletters where, amongst others, the Royal Society for the Prevention of Accidents was quoted as wanting parents to know that "bumps, bruises and grazes are not serious injuries and are part of growing up" (Deepwater, 23 June, 2008, p.1). In a similar vein another newsletter proffered that:

> "Significant research … [was] … emerging from around the globe and not just from educators but from doctors, psychologists and psychiatrists that … [was] … highlighting the need for outdoor play, for connection with nature and for play which involves differing levels of risk" (Deepwater, 1 September, 2008, p.1).

Just two weeks after the above, Little and Wyver (2008) were quoted on the front page of the newsletter (15 September, 2008, p.1) advising that:

> "failure to provide children with stimulating and challenging experiences through

[46] Deepwater's "outside learning time" is what other schools refer to as recess and lunch.

which they can engage in positive risk-taking exposes them to different risks that compromise their health and development”.

The high profile Deepwater accorded to repositioning risk also produced new practices of supervision in the schoolyard. For example, Deepwater staff related that supervision was about trying “to help them [students] to help each other” (GT 2010.04.27, p.1), "not policing" (CB 2010.03.18) and giving students responsibility for their safety. Additionally staff recognised and celebrated colleagues and students who engaged with risk in welcoming, respectful and constructive ways. For example, staff who invented ways for students to interact with stormwater that inundated parts of the schoolyard were congratulated and others were reminded that inquiry pedagogy is about "recognising the importance of grasping these opportunities when they are there – not stopping them [children] from playing near the water but encouraging their engagement with it" (Staff meeting minutes, 21 July, 2009). Concurrently, images celebrating student engagement with stormwater were displayed on the front page of the school newsletter (Images 16 a - c).

Images 16 a - c. School newsletter images celebrate children's engagement with stormwater. a) A student balances on narrow causeway placed across a puddle (R,13). b) Students sail toy rafts in a stormwater puddle (L,11). c) Students float paper boats in Deepwater's ephemeral creek (O,17). (Source: Deepwater, 11 September, 2009, p.1.)

Deepwater also involved children in development of the schoolyard so, as they did with stormwater, staff consciously animated inquiries that reimagined, planned and developed the schoolyard with the children. Part of those processes allowed students to develop and review community rules including, for example, where ball games and games of chase were appropriate. One outcome of these practices was that students felt as though they were a good fit with their microsystem. For example, a student reported:

“Its kind of not like school to me, it’s like a home. It feels like there’s some freedom and we get more input into what happens in the school. Here they ask the kids ‘how do you like this idea … [and] …what do you think about that idea?' ” (Deepwater, 8 June, 2007, p.4).

Later this study (section 5.2.3) discusses how changes in teacher conceptualisations of children support what, in other contexts, Staempfli (2009, p.272-273) describes as “a sense of continuity, a sense of belonging, and a sense of mattering”.

Deepwater’s conceptualisation of inquiry and agency also produced several organisational changes. For example, the school's emphasis on rhythms (as opposed to time) in learning led to experiments with split, shared and extended recess. Similarly, using word of mouth to indicate the end of lunch breaks (bells, whistles and sirens were never used to signal changes in learning times) and staff reorganising their programmes facilitated "seamless learning" (Staff meeting minutes, 21 July, 2009, p.4). School consideration of time and timing also enhanced children's ability to extend activities over days, weeks and even months. Both indoors and outside, students were encouraged to use work-in-progress signs that allowed them to leave unfinished work in the knowledge that it could be resumed at some later time. This meant that:

“If you have a look around Deepwater … you might be tempted to think that the kids had forgotten to pack up. Chess games sit half played; farm animals sit in their wooden enclosures; and, in another corner, a little house lays quiet, phone still off the hook as if someone left mid conversation” (Deepwater, June 5, 2011, p.10).

An intended outcome of work-in-progress was that students would experience learning as "ongoing with time to come back to projects, to make sense of thinking and thus to try out new thoughts and ideas" (Deepwater, 5 June, 2011, p.6) and it appears that this goal was achieved in the school’s first year. For example, a ten year-old student was quoted in the school newsletter as stating that:

“This year was very different to my years at other schools I have been at. It was different because we got to have input in most things … also at other schools you wouldn’t have been able to keep your creations and stop them getting wrecked” (Deepwater, 13 December, 2007, p.3).

Deepwater’s liberation of time as an actor in students’ experiences can clearly be constructed as one of a suite of practices that potentially afford agency and relationship. Additionally, when combined with Deepwater's position on schoolyard activity such practices can be positioned as promoting liminality. For example, being "bored" was discussed in a school newsletter as a potential opening for discovery (Deepwater, 15 September, 2008). The implications of children being able to engage in extended periods of self-chosen affordance actualisations are discussed in the results chapter of this thesis.

Sustainability

Recently Deepwater's foundation principal commented that "shifting to what children can do was, and still is, the central challenge" (M. Grace, personal communication, May 2, 2014). Central it may be but the sustainability of individual system elements is also influenced by same and higher-level factors. For example, a government-sponsored report indicating that the primary years curriculum is content-heavy and should be reduced "to a narrow core" (Australian Government 2014, p.245) may free up time and resources for inquiry or, alternatively, concentrate school energy and resources on delivering staged, predetermined and easily assessable content. Given other report comments relating to quality and accountability, it is this author's view that the latter outcome is more likely. Weighed against calls to refocus on basic content is evidence for the positive influence of un-structured time on children's higher-order capacities (e.g. Barker, et al. 2014, Dadvand et al. 2015) and for the beneficial effects of spending time outdoors.

At the local level indications are that the idea of enhancing student agency may be sustainable but that its operationalization may sometimes be fragmented. In 2011, for example, an injury to a student precipitated staff prohibiting running games in an place that students had helped re-vegetate for running (see Image 10 & Image 14). At another time staff also prohibited children running on paved/concrete paths. Balancing these constraints was confirmation from Deepwater's new principal that teachers ought not police[47] schoolyard affordance actualisation but should ask questions and help students put information together while they were making constructive choices. For *GfL* the principal's opinion expressed Deepwater's fundamental tendency toward liberating student agency, a tendency that was evident in the principal relenting on the prohibition

[47] This idea is taken up in section 4.3 of *GfL*.

of running in the re-vegetated place after repeated advances by students.

The principal's actions and staff's tolerance of some running on paths illustrate a tension that is common in social systems; a tension that Wenger (2012) describes as a dynamic balance of participation and reification. It is, of course, not only adults who experience such tension, they are also manifest when everyday affordance actualisations extinguish children's novel initiatives. For example, student's walking along a path made it impossible for two five year-old boys to maintain a new creation (see Images 77 a-c). More generally the tension is apparent in schoolyard interplays of (i) outlying or new affordance actualisations and (ii) practices intended maintain established orders. To date observations show that Deepwater's strategy for negotiating these tensions whilst also sustaining student autonomy by "making explicit the connections between individual actions and collective values and ways of knowing" (CB 2011.08.29) was being successful.

Transferability and summation

In educational contexts where systems or ecological approaches are valued Deepwater's concept of liberating student agency would seem to be highly transferrable and indications are that the approach is being transferred to other contexts. In South Australia, for example, the state government's *Re-imagining Childhood: The inspiration of Reggio Emilia education principles in South Australia* (Rinaldi 2013, p.43) report recommends "conducting a complete review of existing state policies and practices with the lens of the child as a fully participating citizen from birth." The current study is unqualified to comment on the likelihood of this outcome but notes, however, that the interests of commercial play providers (e.g. McKendrick, Bradford & Fielder 2000) and equipment manufacturers (e.g. Spiegal 2010), the mechanistic constructions of children discussed in section 2.2.2 and 2.4.2 of this thesis and, potentially, institutional inertia (Genschel 1993) each support existing practices. Feedback both from visitors to the school and those who have learnt about its work through professional journals or conferences suggests however, that individual and small groups of educators can imagine how Deepwater's innovations may have relevance in other contexts. For example, an early childhood educator who attended the 2013 South Australian Literacy and Numeracy Expo responded that "some people ... are trialling this" (anonymous author, personal communication July 12, 2013). Similarly, following a keynote address that described Deepwater's ideas to a gathering of approximately 200 educators the conference's organising committee emailed "to affirm the work that's happening at Deepwater and acknowledge the influence it's having in the state" (P. Cook, personal communication, August 20, 2012). These responses suggest that Deepwater's innovation may be transferrable to other contexts.

4.2.4 Idea three: adult support may enhance schoolyard affordances

Deepwater students were encouraged to adopt welcoming, respectful and constructive dispositions but Malone and Tranter's (2003b) research in three Australian schools points out that, if students are to make the most of a schoolyard's educative potential, similar outlooks are required of staff. They write that "it is not sufficient to have child-friendly school grounds. Having a philosophical commitment ... is a vital ingredient" (Malone & Tranter 2003b, p.300).

The United Nations *Convention on the Rights of the Child* (1990) and respected educational theories suggest that play supports learning and wellbeing but Sutton-Smith (1995) notes that practitioners approach play provision from four rhetorical positions that he names: *play as progress*, *play as power*, *play as fantasy*, and an emerging post-structural rhetoric *play as self*. Deepwater subscribed to the belief that each of its students was a free, responsible being who was capable of constructing meaning from situated activities but, rather than conceptualising student's activity in terms of 'self', the school proposed that students could learn through activity. Clearly, for the most part, staff and students did not concern themselves with the rhetorics of play but used the term loosely when describing children's self-chosen activities. In the school's lexicon free play, when combined with the constructivist approaches that had long been advocated in early childhood education (e.g. High/Scope Educational Research Foundation 1995), was about learning. To maintain consistency and avoid potential confusion about what constitutes play this study puts the school's idea another way - adult support could enhance children's self-chosen affordance actualisations.

Actors

Support may be expressed in many forms but Deepwater's Piagetian-constructivist approach required that teachers adopt reflexive stances in regard to students' self chosen affordance actualisations. Adult involvement with Deepwater students' affordance actualisations was therefore animated through three key tools; (i) the material environment (see Idea 1), (ii) the institutional authority and time given to students to explore and experiment with affordances (see Idea 2) and (iii) reconceptualising teachers' roles with children during affordance actualisations. This section describes the latter mode of influence.

Practices

The idea that adults could support students' self-chosen activities became an actant via the school principal for whom the practice of cultivating conceptual environments represented a “struggle of mind … [and an opportunity for] … breaking of the old and letting space for the new” (Staff meeting minutes, 21 July, 2009, p.1). This postmodern perspective meant that adult involvement in students' affordance actualisations, though occasionally inconsistent, was usually expressive of the principal's concern that staff “not to revert to old ways of thinking” (Staff meeting minutes, 13 February, 2007, p.1) and that they realise:

> “children’s play culture does not just happen naturally. Play needs time and space. It needs mental and material stimulation to be offered in abundance. Creating a rich play environment means creating good learning environments for children” (Kalliala 2006, p.139).

To develop the schools' position the school principal encouraged Deepwater's staff to initiate teacher inquiries and learning projects that animated and expanded children's capabilities to act (Images 17 a & b). Regular sharing of teacher's inquiry insights during staff meetings and informal gatherings also led to further inquiries and "action and enrichment of students’ outdoor experiences" (Deepwater, 30 October, 2007). Consequently, by the end of July 2007, staff were able to list practices and dispositional factors that they believed had made a difference to student's self-chosen affordance actualisations. The practices and dispositional factors staff named were:

> “explicit teaching;
> shared vision - reinforced, not just letting it happen;
> whole school commitment and expectation;
> positive reinforcement;
> sharing and looking at what was created;
> acknowledgement of what each child’s project was;
> giving value to their learning; and,
> taking the time to do things” (Staff meeting minutes, July 31, 2007, p.2).

Images 17 a & b. Staff-initiated inquiries expand children's capabilities to act. a) Five and six year-olds were introduced to the concept of perimeter and provided with time and resources to explore the concept in the schoolyard. b) Teachers supported older students' inquiries into feelings of peace by supporting the construction of a forest cubby in the school's sandpit.

Documentation from 2007 elaborates one teacher's practice. She wrote that, at the beginning of her teacher inquiry, she noticed that the "seven to nine year-old children were eager to construct and create and [that they] enjoyed making cubbies, shops and building with the blocks" (FE 2007, p.1) during scheduled instruction times. She also noted that children did not carry the activities over to outside learning times. Later, she described how her (i) reflexive approach, (ii) introduction of new materials and (iii) fencing-off a place where the students could experience a sense of control, engaged students in miniature world activities (Images 18 a & b) and "broke down that gap between inside and outside learning time" (FE 2007, p.4).

Images 18 a & b. Teacher-initiated miniature world activities. Inquiries that allowed children the time, materials, places and authority to imagine and act subsequently influenced whole staff conceptualisations of their roles and practices.

As eco-literacy teacher with responsibility for building “capacity, skills and dispositions in the area of environmental and sustainable education” (MG 2008.03.24, p.7) I was deeply involved in and committed to staff research into students’ outdoor affordance actualisations. My brief was to work with all members of the school community and “focus on learning through outdoor play and the interconnectedness between indoor and outdoor learning” (Staff meeting minutes, 3 March, 2007, p.2). In 2008 the school principal reported that my contribution to the teacher inquiries had made a significant contribution to the quality of students’ engagement with valued learning at Deepwater and to teacher conceptualisations of their roles.

Outcomes

At one level the outcomes of teacher inquiries were clear, affordance actualisations that were initiated during inquiries became patterns of activity that were continuously reinvented by other people in other schoolyard places. For example, miniature world making that was initiated in 2007 continued in expanded forms throughout the period of *GfL* research (**Images** 19 a & b).

Images 19 a & b. Students continue patterns of affordance actualisations that were initiated during teacher inquiries four years previously. a) A student shows 'Mushies' that she and her friends had brought to school. b) Students included beds and snacks in this place for their Mushies.

Deepwater posited that adults could support students' self-chosen affordance actualisations and, mindful that adult beliefs could influence children's activities, the school relabelled recesses and lunchtimes, as well as teacher yard duties, 'outside learning'. In addition educators engaged in dialogue and inquiries that both enhanced student action potential and changed how staff conceptualised their roles. For example, the principal commented that inquiries “have taken the students, parents and ourselves such a long way with the idea of play and imaginative play” (MG 2008, p.1). Other communications also affirmed that staff conceptualised their habits of mind as influences on student activity. For example, school documents state that:

> "play is integral to the academic environment … [and that] … teachers' beliefs about play strongly influence both what we notice children doing and our subsequent engagements with children's play" (Deepwater, 29 July, 2009, p.2).

The priority given to ongoing teacher reflection was an outcome in itself and this was expressed in Deepwater staff continuing to place a high priority on supporting students' self-selected activities. Additionally, staff continued to set "children up for play" (Staff meeting minutes, 29 March, 2011, p.1) "through subtle observation, providing materials if needed, a suitable setting and just being available as an encouraging presence" (Deepwater, 15 September, 2008, p.2).

A further outcome of Deepwater staff reconceptualising relationships with students' self-chosen affordance actualisations was the feeling that supervision at outside learning times was a relatively pleasant experience. For example, a new staff member suggested that, in comparison with other schools, outside learning at Deepwater was:

> "so different and refreshing. What I loved was the cooperation with all the children, they all played well together. There are cubbies being made and there are signs saying "work-in-progress". At the schools I have come from they have balls on the oval and play equipment and there just isn't the cooperation, in fact I would describe it as very competitive, which causes problems at playtime. I just found it absolutely wonderful to watch the children at play …" (HL 2010.01.27).

This new staff member's observations are consistent with long-standing research relating competition to undesirable social and educational consequences including (i) greater exclusion of low status participants (Rabbie & Wilkens 1971, Tryon & Keane 1991), (ii) increases in aggressive behaviour (Bay-Hintz, Peterson & Quilitch 1994) and (iii) decreases in participants' self-efficacy (Chan & Lam 2008).

Sustainability

Over time, Deepwater's focus on staff habits of mind as influences on student affordance actualisations gave way to other priorities (e.g. curriculum inquiries) but Deepwater consciously normalised reflective practices into 2008 and beyond. During the period of normalisation staff were prompted to remain mindful of their attitudes toward students' activities. For example, one of the principal's weekly bulletins drew staff attention to:

> "children's creative play ... have you seen the things they are doing in the back garden and with flowers? Gorgeous!" (MG 2010.05.06, p.2).

Similarly, photographic documentation by both staff and students was shared through staff meetings, homegroup conversations and whole of school meetings, school newsletters and at the school's Annual General Meeting.

Although communications maintained staff mindfulness of supporting students' self-chosen affordance actualisations, the idea that teachers might be reflexive clearly shares, with Ideas One and Two, a susceptibility to the type of "neglect, exclusion or too great predominance" (Wadsworth 2008, p.169) that potentially threatens the sustainability of any innovation. A written reflection from Mr B. Walsh, former director of Resources Policy and Capital Programs with the New South Wales Catholic Education Commission, confirms the continuing support of staff for experience-based learning however. Mr Walsh took an interest in the original development of Deepwater and visited several times after the school opened in 2007. Following his participation in the 2014 CEFPI visit to Deepwater he confirmed an "overall impression ... that the school has remained true to its original conception" (B. Walsh, personal communication, June 10, 2014). The sustainability of Deepwater's innovation may be related to a variety of factors including educators' professional beliefs, wider repositioning of risk as potentially beneficial (e.g. Bundy et al. 2009, James & James 2008, Standards Australia 2014, UNCRC 2013, Wyver et al. 2012b) and positive feedback about the school's approaches from local, national and international visitors or, indeed, a combination of these factors. Perhaps most significantly though, students also sustain Deepwater's innovative ideas and, given that established and emplaced childhood cultures are remarkably resilient (Meckley 1994), it can reasonably be expected that Deepwater's culture will be sustained while schoolyard potential affordances are available to students. In summary then, it is perhaps unsurprising that Deepwater's support for schoolyard activity, learner agency and teacher reflexivity remained high during the two years when the school was managed by five different principals and continued into the sixth year of this study. Perhaps too, there is the possibility that the school's ideas may be sustained into the future.

Transferability and summation

Since Deepwater opened, its school buildings, grounds and programmes have been the subject of considerable attention; educators, parents and students from other schools have toured Deepwater; administrators, academics and postgraduate students have examined the school’s practices and, Deepwater's students and staff have described their experiences in other forums. As a result the school's conceptualisation of its environment, student agency and teacher reflexivity have been shared and tested beyond the boundaries of the school. Post-structural views which suggest that everything is emergent remind us, however, that nothing is directly transferable; instead they suggest that every difference makes a difference. Thus, although Deepwater's belief that teachers’ habits of mind might positively influence children's activities may resonate at other moments in other places, there can be no guarantee that any idea, however worthy, will survive beyond the particular time-space in which it is expressed. An email from Deepwater's foundation principal suggests, however, that other educators are reconceptualising their roles in ways that would be familiar to Deepwater students:

> “A teacher who visited Deepwater ... couldn’t wait to tell me that ...
> she took the kids to the local park and lo-and-behold a tree had fallen down.
> Normally, she would tell the children to move away and leave the tree alone but this time she watched.
> And of course the children ran towards it.
> So, remembering Deepwater, she told the kids to explore.
> She felt tense all during the exploration, worried about them getting hurt but they didn’t and they had a ball and laughed a lot”
> (M. Grace, personal communication, Sept 20, 2010).

4.2.5 Synopsis

Deepwater Primary School was constructed at a place of transition; a place where school students, staff and wider community could configure questions, inquiries and practices that reimagined local issues and global forces. This allowed Deepwater to imagine and develop a naturalised schoolyard that would encourage inquiry and meaning making. In that time-space Deepwater also rejected "highly governed and controlled risk-free environments" (James & James 2008, p.113) in favour of the theologian Rahner who “defined [freedom] as the capacity to forge a common future” (McEvoy 2008, p.1) and Foucault (1994) on the use of authority to form individuals “in relation to others" (Mayo 2000, p.116) so, to this end, senior staff initiated processes that challenged teachers' images of themselves. As if looking into a mirror staff reflected on the value of:

> "not stopping [students] but observing and setting up the context; giving the benefit of the doubt for [students] to have that experience; allowing time to explain and time for students to experience" (Staff meeting minutes, 21 July, 2009, p.2).

Teachers learning to take cues from students allowed inquiries to flourish, school to reconstruct time as "rhythms" (Staff meeting minutes, 11 November, 2008) and, contrary to long term trends in education (Blatchford 1998, Pellegrini & Blatchford 2000), Deepwater to trial extending the periods when children were free to choose their schoolyard activities. As Deepwater matured the ideas it posed and the practices it formed sometimes re-entered the wider environment. Deepwater was "commended for its 'bravery' in allowing an outside play-based education that includes rocks, tree branches, sticks, mud, sand pits and milk crates, and allows tree climbing" (B. Walsh, personal communication, June 10, 2014), for example, and other schools trialled its practice of animating student schoolyard activities to grow learner expertise. In these and other ways Deepwater's innovations, which to this insider always seemed to be in a state of becoming, were changing; they were becoming influential.

4.3 Part two: Schoolyard potential affordances

> *"In any environment, both the degree of inventiveness and creativity, and the possibility of discovery, are directly proportional to the number and kind of variables in it"* (Nicholson 1971, p.6).

4.3.1 Introduction

Grounds for Learning adopts an ecological systems approach to researching how self-chosen schoolyard affordance actualisations influence children's learning so part one of this chapter described the broader environment in which Deepwater's schoolyard is situated. Now, this section takes a functional approach to description of the study site schoolyard; an approach which recognises that "every landscape is a code, and its study may be undertaken as a deciphering of meaning" (Meinig 1979, p.6). In deconstructing Deepwater schoolyard's code and subsequently describing its potential affordances this study uses Heft's (1988 p.36) affordance categories. Consequently this section is divided into nine parts - flat, relatively smooth surfaces, relatively smooth slopes, graspable/detached objects (alternatively known as loose parts), attached objects, climbable features, apertures, shelters, mouldable materials and water.

Previously, reasons for not mapping potential affordances were discussed (section 3.4.3) but here the reader is reminded that an aerial photograph is presented at the beginning of this chapter and that in-text alphanumeric grid references provide a sense of relative locations.

Finally, a caution, whilst *GfL* made every effort to ensure that the following descriptions and interpretations are as accurate as possible, the reader is reminded of geographer Meinig's (1979, p.6) words:

> "any landscape is so dense with evidence and so complex and cryptic that we can never be assured that we have read it all or read it alright".

With Meinig's (1979) words in mind *GfL*'s exposition of schoolyard potential affordances commences.

4.3.2 Flat, relatively smooth surfaces

There are seven types of flat, relatively smooth surfaces at Deepwater; timber decking, asphalt, concrete, turf, mulch, softfall and compacted earth. In the literature flat, relatively smooth surfaces are associated with walking, running, skipping, football and/or cycling but *GfL* observations and other research (Titman 1994) show that students can actualise additional affordances on relatively flat surfaces.

Timber Decking

Each of Deepwater's purpose built learning spaces incorporates a feature borrowed from the schools of Reggio Emilia; the piazza or shared learning space. This is an interior space immediately adjacent to clusters of four homerooms that is designed, resourced and regulated to facilitate meeting and associating with peers, shared learning and community gatherings - in short social affiliation. One cluster of four homerooms was not purpose-built however, so its two pairs of transportable buildings are arranged and provisioned with outdoor spaces that are intended to function as shared learning spaces. Part of that provisioning includes two relatively flat, smooth timber decks, one within the 116m^2 rectangular space formed by the two pairs of homerooms (G,15) and the other a 52m^2 deck under a verandah on the northern side of the cluster (G,12).

Within the $116m^2$ enclosed rectangular space $60m^2$ of timber decking provides access to the four surrounding homerooms as well as the furniture, structures, loose parts, water and mouldable materials that teachers provide to stimulate and support student investigation and creativity (Image 20b). The other $52m^2$ of timber decking is accessed from either of the northern pair of homerooms and from the schoolyard by two broad steps and a ramp (Image 20a). Where the buildings, steps or ramps do not enclose the raised deck steel railings fence the space.

Images 20 a & b. Timber decks are provisioned with resources that make them outside learning places. a) Chairs, blocks and mats on the northern deck. b) The enclosed central deck, sandpit and gazebo.

Both sets of decking are intended to be outside learning spaces so each morning the teachers who occupy the northern pair of homerooms arrange furniture and loose parts under the verandah. Typically the teachers (i) decorate small outdoor tables with bunches of flowers, pencils and paper, (ii) place construction blocks on mats and set out games and (iii) arrange chairs to encourage small group interactions. A key consideration when setting up the deck includes achieving a balance between the aesthetic and functional and between diversity, simplicity, continuity and novelty. For example, whilst maintaining an impression of continuity, the teachers sometimes also set out novel "provocations" (FE 2011.08.08) that are intended to stimulate questioning and new behaviour. The teachers who occupy the southern pair of homerooms also check and arrange brooms, pots, pans and a variety of other containers in and around the sandpit and gazebo. The whole effect is intended to give the decks an inviting "homey" (FE 2011.08.08) look and stimulate young children's engagement with people and objects. Nairn, Panelli and McCormack (2003) indicate that, where young people interpret environments as familiar and comfortable, they feel included so the deck's arrangement of objects may have been a contributing factor in, for example, a newly enrolled child's decision to occupy himself on the verandah deck at each outside learning time during his first six weeks at school. The deck is also intended to communicate messages of welcome, collaboration and inclusivity to parents, staff, visitors and the wider community so spaces are arranged to function as transitional places. Observations show that the decks serve as before and after school drop-off and collect points, venues for impromptu adult conversations (while children pursue other goals) and places where younger siblings can engage with one of the school's more defined and familiar outdoor spaces.

Maintaining the decks as outside learning areas is an ongoing task that requires daily setting out and packing away. The culture of deck use also requires regular cultural scaffolding and this is especially so when new students are enrolled. A message to all staff at the beginning of the third school term is indicative of the support teachers provide:

> "As we welcome everyone back ... could you remind your home group of the expectations of the deck area during outside learning time. Everyone is welcome to use this space to play but ..." (FE, 26 July).

Clearly then, the two timber decks that substitute for an indoor piazza are highly valued as outside learning places by Deepwater staff and students.

Deepwater schoolyard has one other timber deck and this is adjacent to the twelve and thirteen year-old students homeroom (J,19). The 14.5m^2 deck has no fixtures but senior students have furnished it with a table and benches that provide elevated seating from which students can view most of the school sports field to the south as well as the northerly approach to building (Image 21a).

In fine weather the deck is used as a classroom spill-out space and at outside learning times during the first two terms of 2011 (when the gate near the deck provided access to the sports field) it was a popular gathering place for senior students. The deck is exposed to both full afternoon summer sun and south-westerly cold fronts in winter so, when winter flooding at the nearby gate meant that access to the sports field was by another entrance, the deck's position on a key access route was lost and it was used infrequently during the second half of the year.

Images 21 a & b. Southern timber deck. a) The exposed deck adjacent to Deepwater's transportable homeroom offered views to the sports field and was a favourite gathering place. b) Four students who usually frequent the deck sit on a shaded gravel surface 10m away because they felt too hot (air temperature 16^{oC}, 1:37 pm, August 25).

Paving/concrete

Each of the study site's two main buildings (G,7 & M,14) is surrounded by a 0.9m wide concrete path which broadens to 2.5m under verandahs. The paths provide safe access to each building but have the additional effect of creating a running circuit that suits hiding-chasing games. Consequently, and despite teacher prohibitions, students sometimes choose to actualise the paving/concrete's running-hiding affordance. The attractiveness of paving as paths for running-hiding games is also enhanced by the proximity of the turf and re-vegetated areas where children run and hide. Running-hiding behaviour on paved areas is given greater prominence by the fact that, unlike the timber decking that is provided for the five and six year-olds, the purpose-built paved verandahs (the northern building is provided with 118m^2 of verandah-covered paving and two paved sitting places of approximately 15m^2 each while the southern building is provided with 207 m^2 of verandah-covered concrete and a 50 m^2 spill out space) are not generally provisioned or maintained as outside learning spaces. The exception to this rule is near the entrance to the northern building (E,7) where the school chaplain has placed furniture so that small groups can undertake craft at outside learning times. Even when the chaplain is not present, students often use the table for craft activities and parents use the table and chairs as a place for conversations while they wait for students to be dismissed at the end of each school day.

Given that staff do not, in general, maintain the paved surfaces as outside learning places it is unsurprising that some students show a willingness to adapt the areas to suit their purposes. During the course of this study for example, students brought graspable/detached objects under the paved verandahs to create places for cubby making, sand and water activities, table tennis, handball, skipping and dancing. Staff variously responded to these innovations by prohibiting sand and water being under the verandahs, looking on as students enclosed part of the southern spill-out space and providing and monitoring resources for dancing.

Images 22. a & b. Students adapt paved areas to suit their purposes. a) Middle-primary students arranged benches and tables to enclose a pretend restaurant under (P.16). b) Loose parts rest on a wet area-bench and trough (E,6). In the dark middle ground are larger loose parts that students arranged as cubbies and the hourglass lawn and adjacent vegetation are just visible in the background.

Turf

Two areas of relatively flat, mown turf are established at Deepwater. An hourglass shape of approximately 570m^2 is centrally located in the main schoolyard (L,7) and a 7240m^2 sports field is located outside the fence to the south of the schoolyard (H,20) to (U, 20).

The northern four metres of the hourglass-shaped turf rise in elevation by approximately 1.5m (see *Relatively smooth slopes*) and together with adjacent bushes this provides students with the important prospect, refuge and retreat qualities that Appleton (1975) identifies - affordances that make the northern part of hourglass a popular choice for chasing games. School rules prohibit ball games in both the northern and southern parts of the turf so, in addition to running and chasing, the turf also affords sitting and social gathering, cartwheeling, crawling and walking. Students use the southern loop of the hourglass-shaped turf in much the same way as the relatively flat northern turf but episodic flooding provides additional affordances when, after prolonged heavy rain, up to 57m^2 of the turf can be inundated (see *Water* below).

The southern-most turf, or sports field, affords running, games, privacy and delivery of physical education curricula. It is accessed in lesson times at teachers' discretion and during outside learning times except during periods of rain (when students are not permitted outside). Sampling and anecdotal evidence suggests that, with the exception of rain events, student actualisation of sports field affordances is not weather dependent. During winter the sports field is marked with lines for soccer matches and provided with two goals and the addition of these fixed objects channels student activities toward soccer matches.

In common with Malone & Tranter's (2003a, n.p.) observation "that large open spaces dedicated to physical activities did not have a proportional number of users" *GfL* observed that only approximately 16 percent of Deepwater children (n=28) occupy the sports field while 80 percent choose more vegetated places for their activities. Of those who attend the sports field only 15 percent, on average, are girls (see Table 5) and the majority are older boys who engage in traditional ball games.

Table 5. Age and gender profile of students using Deepwater's sports field. Average daily attendance at the sports field was 28 students.

	Boys	**Girls**
Age 5 to 7 years	21%	4%
Age 9 to 10 years	27%	5%
Age 10 to 13 years	37%	6%

The observation that older boys tend to be users of sports fields is consistent with existing research (see Fromberg & Bergen 2008) but is not a subject of this thesis. Also outside the scope of this thesis is the observation that other groups of children actualise the relatively under-used sports-field (at Deepwater averaging approximately 250 m^2 per student) for privacy by gathering in its more remote parts.

Whilst actualisations of sports field affordances are not a focus for *GfL*, student attendance at the sports field is of interest for two reasons. First, the availability of a sports field (and asphalt surfaces) means that other areas are free of ball games and alternative activities can flourish. During informal interviews teachers recalled that, when the school was new and the schoolyard smaller, students and staff chose to prohibit ballgames because they were not compatible with the more constructive activities that the majority favoured. The sports field may therefore be said to indirectly enhance opportunities for constructive activities. Second, because some students choose to attend the sports field there is a small reduction in pressure on other places.

Images 23 a - c. Relatively flat turf is a polymorphic resource. a) A student actualises affordances for visual connection and sitting (I,20). b) Linus and peer actualise visual and auditory connection for cooperation (L,5). c) In the absence of ball and running games this group actualises relatively flat surfaces' affordances for social gathering and control over who enters the space (M,10).

Asphalt

The study site has two arcs of asphalted surface. A northern asphalt surface (340 m^2) is adjacent the six to eight year-old children's homerooms and has one fixed basketball goal, a painted handball court and painted hopscotch squares (E,5). Similarly, the southern asphalt surface (350 m^2) is adjacent the 8 to 13 year-olds homerooms and has one fixed basketball goal, one fixed netball ring, two painted handball courts and painted hopscotch squares (P,11). The southern asphalt surface slopes to divert stormwater to an artificial creek (R,14) but a shallow puddle remains on the asphalt after rain. Both asphalt surfaces are open to the elements and are cold and wet in winter and hot in summer. A temporary, uneven, stony and broken asphalt pathway also marks the designated path connecting the main buildings.

Teacher documentation and chalk markings on the asphalt surfaces indicate that, in line with Deepwater's aim of connecting inside and outside learning, asphalt surfaces support curriculum-based learning. Markings include measured and ruled lines, a labyrinth and a circle inscribed with the ordinal points of the compass (Images 24 a & b). Research data also indicates that the asphalt surfaces afford walking and running-across, skipping, traditional ballgames, running games, jumping games, drawing-on, rolling-objects-across and balancing-on. Observations indicate that asphalt is one of the two surfaces where students do not build cubbies and anecdotal evidence suggests the practice is due to the exposed and unyielding nature of the surface.

Images 24 a & b. Asphalt surfaces support curriculum delivery. a) Chalk-drawn compass (P,12). b) Students stand at the centre of a chalk-drawn labyrinth (D,4).

Mulch

Deepwater places a priority on responsible "stewardship of the unique local environment" (Deepwater, 8 December, 2009, p.11) and this is expressed through planting the schoolyard with local indigenous vegetation. Mulching soil with shredded tree bark is usual practice in revegetation (e.g. Rokich et al. 2002) and at Deepwater it has the additional benefit of keeping shoes free of winter mud. Early experiences with students treading muddy shoes through the learning spaces (Image 25b) reinforces the policy of mulching exposed soil so approximately 1950 m^2 of relatively smooth surfaces are covered with up to 10cm of mulch.

Relatively flat mulched surfaces afford running games and, in combination with apertures, attached objects and climbable features it also affords hide-and-seek, collecting-loose-parts and cubby-building. Mulch is less than ideal to sit on however, so students frequently sweep loose mulch. Alternatively, they place copra matting, hessian, cardboard or plastic sheets over the mulch and use milk crates as stools (Image 25a). The moveable nature of mulch pieces also allows children to actualise it as a loose part and, by sweeping aside larger parts, as a means to define-boundaries (Image 33c).

One relatively flat mulched surface is of particular interest to students and its use is an example of how Deepwater's conceptualisation and animation of agency influences students' experience of physical affordances. Deepwater's forest (Image 10 & Image 14) opened for student use two years previously when the surface was bare, compacted earth. In the interval staff and students planned and carried out revegetation so the meadow is now an archipelago of green islands in a sea of mulch. These islands functioned, for a time, as places for running, hiding and constructing. In March staff prohibited running games in the meadow however, but students do not embrace the rule and are attempting to have it changed. The students' attempts have so far been unsuccessful but their efforts continue. (Note: the thinking behind development of the forest is described in sections *4.2.2 Practices*, *4.2.2 Outcomes* and the learning that results from this process is discussed in section *5.5.2 Double binds*).

Images 25 a & b. Mulched, relatively flat surfaces. a) A student covers mulch with hessian to define and make his cubby floor more comfortable. b) Muddy shoes are left outside school buildings.

Softfall surfaces

Australian Standard AS 4422, Playground surfacing - Specifications, requirements and test method 1996 (Standards Australia 1996) requires that impact absorbing surfaces be installed under and around raised equipment. Accordingly, two relatively flat chipped pine softfall surfaces of approximately 190m^2 and 150m^2 are installed under Deepwater's climbing structures (O,9 & T,16). These softfall surfaces ensure that Deepwater complies with the safety standard but observations and anecdotal evidence indicate that students generally give little attention to the impact absorbing affordance of softfall. The chipped pinewood softfall is smaller, lighter and spread more thickly than mulch so it offers affordances that are more typical of mouldable materials and loose parts. For example, students use their feet to plough tracks and running circuits into the softfall (Image 26a), actualise the relatively regular sized pieces of chipped pinewood as ingredients when pretending to cook (Image 26b) and catapult it with a degree of ease and safety from a makeshift trebuchet (Image 26c).

Images 26 a - c. Impact absorbing softfall. a) Students plough aside softfall to construct a running track (T,17). b) Softfall pieces are ingredients for pretend cooking. c) A student loads an improvised trebuchet with softfall (T,15).

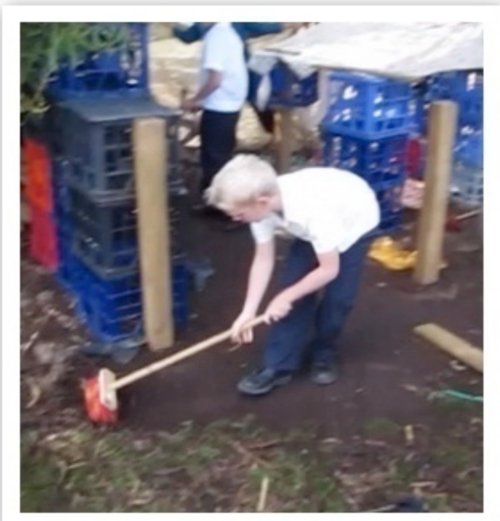
Compacted aggregate, gravel and bare earth.

Deepwater's schoolyard has several patches of compacted earth, the largest of which is a design feature of the 450 m^2 almond orchard (H,11). Differences in levels of the compacted surface and adjacent concrete paths are the result of erosion through use and indicate that the area supports much foot-traffic. Anecdotal evidence indicates however, that the orchard affords passage between the main buildings and that it is not generally used for games because, as a senior student explained, the aggregate of irregular small stones is too slippery and dangerous. Taken together, anecdotal evidence and the almost permanent absence of loose parts and structures affirm that access-to-seasonal-flowers and passage-to-other-places is the dominant affordance of this surface.

Jones's (2000, p.38) study of UK rural children's activities describes polymorphic places that "can sustain alternative uses by children even in the presence of the dominant use". Similarly, *GfL* observations show that Deepwater's compressed aggregate surface, which typically affords movement to other places, is sometimes inundated by stormwater so affords students alternative uses. Deepwater's single gravel path is another example of polymorphism (I,17). On the occasion illustrated in Image 27a, for example, Larry has discovered that he can brush the thin layer of gravel aside to reveal compressed earth beneath. Observations reveal that he and Floyd settle in the middle of the path and sweep a dinner-plate sized area clear then arrange individual pieces of gravel and small sticks in the clearing. Subsequently, the boys continue their activity for 20 minutes but this attracts only the fleeting interest of passing students. On this occasion the polymorphic gravel surface thus affords sitting, definition-of-space and arranging-loose-parts. (The researcher continued as a part-time teacher at the study site and observed similar affordance actualisations in February and March of 2014.)


Images 27 a & b. Compacted gravel surfaces. a) Loose gravel affords marking a space (14 February) (I,17). b) The single time in six years when a student attempted to use the almond orchard's gravel surface as a place for cubby building (H,10).

Across the remainder of Deepwater's schoolyard patches of bare earth totalling approximately 120m^2 are either remnants of earlier landscaping that are yet to be mulched, temporary places where recent excavation work has uncovered bare earth or places where mulch has been eroded or deliberately swept aside. These patches of bare earth provide students with access to places that afford scratching-marks in the soil (Image 28b), excavation and collecting-soil-to-make-mud. For example, students dig for clay from just below the surface at the southeastern corner of the school's southern building (Q,17), are careful to recover their excavations and mould small pots from the material (Image 44a).




Images 28 a & b. Bare earth is polymorphic. a) A student sweeps mulch away from his cubby because bare earth is more comfortable to sit on and the different surfaces help define the cubby boundary (M,8). b) Bare earth's plastic nature makes it a suitable surface to mark by scratching (M,9).

4.3.3 Relatively smooth slopes.

Deepwater is located on flat ground with a negligible average slope of approximately 1:200 but two constructed earth mounds add to the site's complexity. The mounds are both surrounded by relatively smooth slopes that afford running-down, running-up, tumbling, rolling-down, rolling-objects-up and rolling-objects-down.

The largest mound (K,3) is approximately 1.5m high, has a 400m^2 mulched surface that is planted with trees and shrubs to create a small forest. The four-year-old trees (*Eucalyptus porosa*) have canopies that reach to the ground, so children prefer the space because there are "a lot of places to go" (PJ 2011.05.26) and for the relatively common loose parts, attached objects and apertures that support cubby construction. The extremity of this slope meets the school's northern fence - (H,1) to (L,1) - and trees in this location are popular for cubby building because they are (i) visually separated from the larger space by the mound and (ii) enclosed by the nearby northern fence which doubles as frame that can support loose parts.

The remaining approximately 100m^2 of this relatively smooth slope forms the northernmost part of Deepwater's central lawn and is turf-covered (K,5). The location is especially favoured as both a lookout and resting place in games of chase and hide-and-seek because it affords (i) an open southerly aspect with views to the main part of the school, (ii) access to nearby shrubs (that afford refuge) and (iii) a speed advantage for children running downhill (away from the chaser) compared to those approaching from below. Constant use for these purposes has established the top of this slope as the preferred starting place for chasing games and sometimes up to thirty children will stand there, facing inwards, making a tight circle. The circle remains solid as a countdown is made to start the game then all but one of the children run and, after a further pre-arranged countdown, the child who is 'it' runs too. Typically, when whoever is 'it' has left, a small group reforms on the hill and stays until 'it', perhaps approaching via the cluster of bushes or part hidden by the nearby building, comes too near (Image 29a).

A second relatively smooth slope of approximately 165m^2 creates an amphitheatre-like space adjacent to the northern softfall and fixed equipment (O,7). Children rarely use the slope for chasing and hide-and-seek games because, although the turf affords views to the north and south, there are no immediate refuges. The relative absence of running on this slope allows children to actualise affordances for sitting-on, lying-on and, because this slope is surfaced with shorter less absorbent couch, occasionally sliding-down-on-cardboard boxes (Image 29b).

Images 29 a & b. Relatively smooth slopes have multiple affordances. a) Prospect, refuge and escape afford social-gathering, hiding and chasing games (K,4). b) A more exposed slope affords running and sliding-down (O,7).

4.3.5 Graspable detached objects

School documents and anecdotal reports support the view that, since opening in 2007, Deepwater staff (including this author) made concerted efforts to provide a diverse range of graspable detached objects (hereafter known as loose parts[48]) for student use. For example, an early school publication *Outside Learning at Deepwater* (2008) illustrates students using 49 different types of loose parts during self-chosen schoolyard activities (Table 6) and *GfL* observations during 2010 and 2011 catalogue 46 similar items (Table 7). Renewing and re-provisioning with loose parts is also ongoing and school and homegroup newsletters regularly call for donations of loose parts.

Table 6. Loose parts pictured in *Outside Learning at Deepwater* (2008).

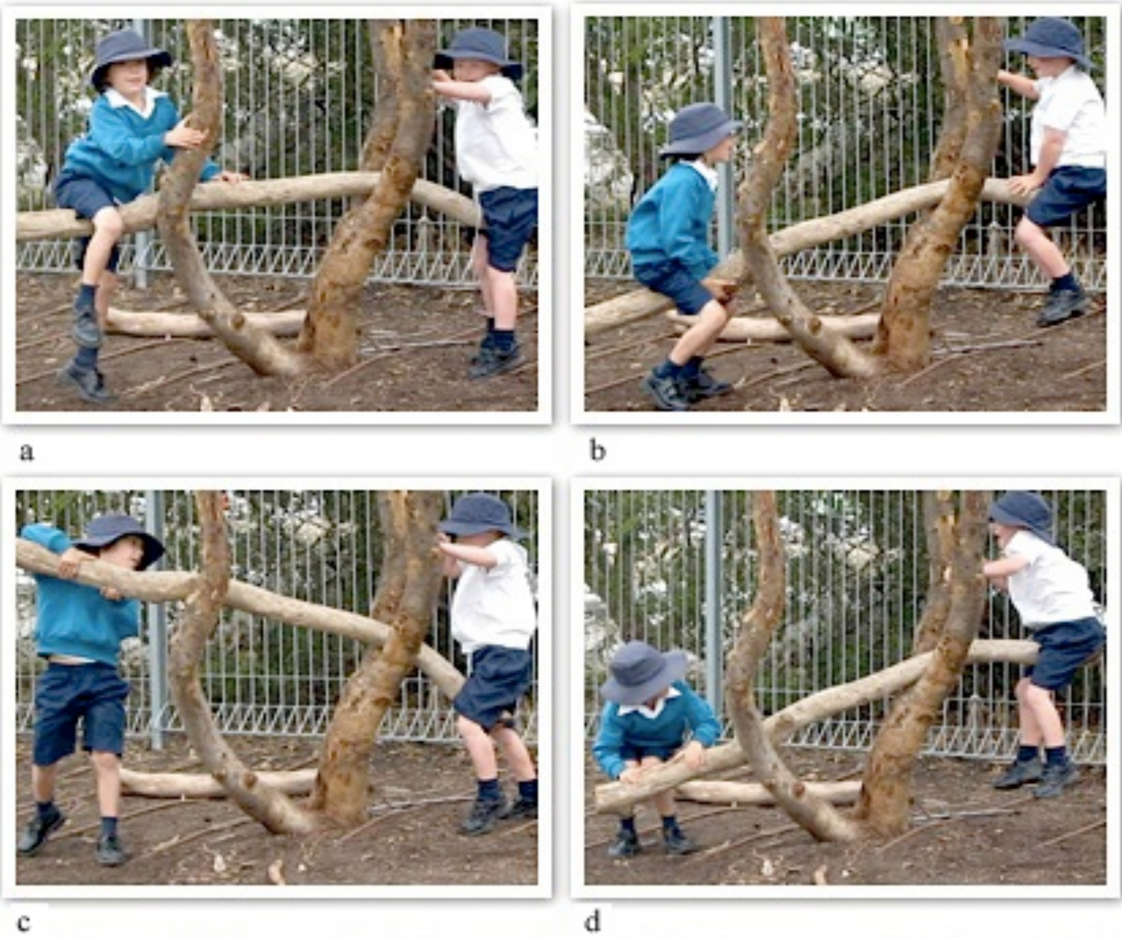
Balls, barrels, basket, beans, blanket, branches (bamboo sticks, eucalyptus, prunus, vine) buckets, cash register, cooking pots, fabric (bed sheets, shade cloth & table cloths), flowers, hay bales, kettle, lizard, logs, magnifying glass, measuring jugs, mixing containers (plastic & metal), milk crates, mud, paint brushes, papers, plant stems and leaves, plates (Plastic), recorder (musical instrument), sand, saucepans, seeds, sieve, spoons (plastic), stones, stormwater pipes, table, toy figures, toy spades, umbrella, watering can, and wooden blocks.

[48] This term is taken from Nicholson (1971) and is the favoured term in contemporary literature.

Table 7. Graspable detached objects observed in the Deepwater's schoolyard during 2010 and 2011.

Balls, barrels, benches, bowls, branches, brooms, buckets, cardboard boxes, carpet squares, chalk, coffee pot (cord removed), containers (plastic), egg flips, flowers, forks, spoons & ladels (plastic), hessian & other fabric, ice moulds, jugs, jute matting, kettles, leaves, logs, masonite, microwave oven (cord removed), milk crates, mugs, outdoor chairs and tables, paper, plastic sheets, pots, reeds, saucepans, sticks, stones, straw bales, string, timber planks, trays, vegetables, watering cans, wiring spools, and woolen yarn.

The primary affordance potential of any loose part is movement and observations show that students actualise this affordance in a myriad of ways[49]. For example, placing a narrow log into a tree fork (Images 30 a - j) clearly affords social exchanges, balancing and experimenting/experiencing the operation of a lever. Similarly, balancing a piece of timber and other loose parts on a log (Images 31 a - f) affords both social gathering and collective action.



Images 30 a - d. Students explore how a narrow log placed in the fork of a tree affords moving one another, (D,2).

[49] In this respect von Bertalanffy's (1968) term multifinality is appropriate.

Images 30 e - j. Students explore how the affordances of a lever and fulcrum allow them to move one another (2011.03.09), (D,2).

Images 31 a - f. Students balance a piece of timber on a log then progressively add loose parts (2011.08.15), (M,7). Two of these students were participants in the lever and fulcrum activity of five months earlier (Images 30 **a - l).**

Working with meaning

Activities that use loose parts for levering and balancing clearly actualise primary affordances but children's experiences of phenomena related to levering and balancing also suggest potential secondary affordances. One such possibility comes from the

Australian Curriculum which suggests that “students [should] interpret proportional reasoning [and] apply proportional reasoning … to solve problems in authentic contexts” (ACARA 1012, p.7). Student actualisations of schoolyard affordances illustrated in Images 30 a - j and Images 31 a - f show participants adjusting the positions of people and objects on levers to achieve particular effects so are examples of applying proportional reasoning (albeit without involving numeracy) in an authentic situation. Thus, the activities are an example of actualisations of loose parts potentially affording curriculum related activity. At this point it is important to note however, that student affordance actualisations of this type are not necessarily related to learning academic or scientific[50] concepts. Indeed Fleer (2010) indicates that, whilst student actualisations of affordances for balancing, levering and so forth can consolidate concepts and are likely to be foundational for scientific learning, additional cultural scaffolding is likely to be required for students to learn the related academic concepts. Nevertheless, the examples point to the possibility that actualising loose parts may offer secondary affordances.

Learning is a differentiated concept and non-academic learning can be directly inferred from the above examples. Malone and Tranter's (2003a) earlier research also shows that children’s object use affords opportunities to construct and try on identities, and, because children in the above examples are clearly enjoying themselves, the examples can be regarded “as proof that the action is a genuine expression of self” (Csikszentmihalyi & Rochberg-Halton 1981, p.100). Informal interviews brought to light several examples of children actualising loose part affordances to try on identities and the example of Harrison, a five-year-old who was new to Deepwater, is illustrative of the processes involved. The history, as related by his teacher, is as follows:

1. For several weeks Harrison explored, constructed and innovated with wooden blocks on the timber deck adjacent to his homeroom (I,13);
2. In a short period Harrison's activities became a focus of positive peer attention and more peers joined the activity;
3. Harrison enjoyed the attention his innovations afforded and sought further opportunities to innovate; and,
4. Harrison shared additional innovations with his peers.

[50] Vygotsky uses the Russian term for ‘scientific’ to describe the generalized or academic concepts that are the basis of the natural sciences, social sciences and humanities (Karpov 2005, p.172).

In their study of Melbourne pre-school children's activities Newton and Jenvey (2011) suggest that object use of the type described by Harrison's teacher affords opportunities to practise social skills but another interpretation may also be appropriate. Harrison's teacher comments, for example, that success in the activities afforded Harrison two secondary benefits, viz: (i) a central role in what Holland, Lachicotte, Skinner and Cain (1998, p.52) refer to as a socially, culturally and physically "constructed realm of interpretation", i.e. his block-building peer group; and, (ii) a new motive for activity - maintaining peer group centrality. Subsequently, Harrison’s teacher speculated that his new motive was the force behind his continuing efforts to innovate with loose parts.

Harrison’s experience of loose parts as affording a new identity was not unique. For example, research also shows that Freddie and two same-age boys whose associations had previously been antagonistic, also tried on, and eventually sustained, new identities through activity with loose parts. In Freddie's case *GfL*'s research shows:

1. Freddie making what he called an 'ant adventure park' from damp sand and a large tub;
2. The 'adventure park' and ant behaviour becoming a centre of interest for Freddie, two boys who had previously been antagonistic toward Freddie, and up to half a dozen other same-age peers;
3. Nearly two weeks of negotiated, collective attention and activity with the tub, sand and ants;
4. Freddie, the two boys, and somewhat fewer others beginning to collect caterpillars;
5. Actualisations of caterpillar-related affordances supporting collective engagement and negotiated activity;
6. The larger group dividing and Freddie and the two other boys choosing to build a cubby;
7. Joint cubby making activity with loose parts;
8. Stable social interactions without loose parts.

In the above, the pattern of Freddie's affordance actualisations matches the phenomena Vygotsky (1934/1978, 2004) describes as *mediation* and *internalisation* within a zone of proximal development. From this social constructivist viewpoint, and paraphrasing Miller (2003, p.10), Freddie's affordance actualisations represent learning not as "a steady accretion of knowledge about a task, [but instead as] a shift in one's basic understanding of what the objects and events in a setting are." In Harrison and Freddie's cases it is therefore plausible to suggest that activity with loose parts and social others may afford new identities as social beings - a secondary affordance. Without discussing the mechanisms involved, a school newsletter canvasses just such a possibility:

> "the environment can be a teacher ... [and] loose objects like sticks, sheets and boxes are important ... because they encourage students to construct places ... [and] affirm our students as good, competent, creative learners. ... Students are being leaders, listeners, negotiators, helpers, carers, designers, builders and much more" (Deepwater, 6 December, 2010, p.4).

The potential for activity with loose parts to afford secondary benefits is discussed further in chapter five of this study.

The primary reason Deepwater students value loose parts is for what can be done with them and cubby building is a popular way that students use these resources. It is common occurrence, for example, to observe sheets of hessian strung between fences and trees to make shelters (Images 32 a & b), branches and sticks propped one against another to form enclosures and long grass (*Themedia triandra*) pushed aside to form nests.


Images 32 a & b. Loose parts afford cubby building. a) Wrapping hessian around posts creates a place that affords privacy. b) The spatial arrangements of cubbies affords some control over social processes.

*GfL'*s research suggests that cubby making may afford more than shelter; it may also afford working with meaning. For example, students carefully place handkerchief-sized scraps of hessian on sticks to mark entrances (Image 33a), tie lengths of yarn around posts to suggest a castle (Image 33b) and sweep aside mulch to define spaces (Image 33c). For *GfL* schoolyard affordance actualisations of this type are reminiscent of the literature discussing phenomenological aspects of home. Fox (2002) describes home as a territory offering security and control, continuity and privacy, for example. Csikszentmihalyi and Rochberg-Halton (1981, p.123) identify home as a “material environment that embodies what he or she considers significant” and geographers Blunt and Dowling (2006, p.254) interpret it as “a relation between material and imaginative realms and processes, whereby physical location and materiality, feelings and ideas, are bound together and influence each other.” Similar phenomenological interpretations of students' cubby making also suggest the potential for children to use schoolyard affordance actualisations as a means to configure meanings; a possibility that is explored in the third part of this chapter and discussed in chapters five and six of this thesis.

Images 33 a - c. Students actualise loose parts to communicate meanings. a) Linus uses a small piece of hessian and stick to define his cubby boundary (M,6). Young girls use a strand of yarn tied between two posts to mark an edge to Cinderella's castle (I,3). c) Cubby-makers have swept aside mulch to define their floor (N,4).

Work-in-progress

One particular, though easily overlooked, cultural schema and related tool sustains Deepwater children's activities with loose parts. The concept, which is referred to as work-in-progress, is adopted from Reggio Emilia practice so that "learning at Deepwater [can] be ongoing … with time: to come back to projects, to make sense of thinking and thus to try out new thoughts and ideas" (Deepwater, 5 June, 2011, p.10). In practice the concept is supported by signs which, when left on an artefact or in a place, indicate that students, who may be elsewhere, anticipate they will resume their engagement with the artefact or place at a later time. Works-in-progress regulate the use of a variety of schoolyard resources so, in an effort to regularly redistribute resources, children are normally asked to pack away artefacts and places at the end of each school week. Children wishing to continue works-in-progress into successive weeks often ask for and gain permission to retain the resources however.

Images 34 a & b. Work-in-progress signs support meaning making. a) The meaning of this self-made work-in-progress sign is clear - Do not touch! b) Work-in-progress cards identify this collection of sticks as a cultural artefact although the meaning attributed to the collection is not clear.

Teaching about work-in-progress and making signs available gives Deepwater children a placeholder that both extends the repertoire of their activities and expands the potential of schoolyard affordances. Research shows, for example, that work-in-progress affords children control of resources and extends engagement in activities that use those resources (such as making cubbies and ornaments). Clearly work-in-progress affords students the time and authority to return to activities but neither time nor authority are acknowledged in the existing affordance categories.

Works-in-progress that extend over several weeks also afford a secondary effect - more expert perception of meaning. Interpretation of this effect is discussed in section 5.2.2 but ecological perspectives suggest that the effect may be caused by students perceiving work-in-progress first as a functional and then as a transformational invariant.

4.3.5 Attached objects

Attached objects at Deepwater include outdoor furniture, natural objects, fences, gates and objects that could equally be described as climbable features. The attached objects primarily afford support for persons and objects but children actualise this potential in diverse ways.

Fences and gates

Deepwater's fences and gates bound the schoolyard space and direct people to designated throughways. The relatively sturdy fences also serve as frameworks from which students attach loose parts and thus they afford support for student cubbies, flagpoles and hammocks (Images 35 a & b). Generally internal schoolyard spaces are open (except at the edge of three areas of decking and where two 8m lengths of vine trellising are placed parallel to the main path) but the shape of perimeter fencing affects student use of the schoolyard. Where fences meet at right angles, for example, internal spaces function as no-through areas that afford a degree of control over who enters each space so are highly valued as places that afford socialisation. Czałczyńska-Podolska's (2014, p.139) recent study also reports a similar finding: "the highest sociability correlation was found for the enclosure features of open-area zones."

Images 35 a & b. Fixed objects afford privacy and control. Fences, and particularly corners, are favoured as places for construction. a) A nine year-old girl uses the fence as a frame for a seat within a shared cubby (H,1). b) Hessian tied to a fence affords privacy and sitting-in (K,1).

Outdoor Fixtures

Fixed tables and benches overlook Deepwater's large sandpit (J,5), central lawn (K,7), almond orchard (J,9) and ephemeral creek (P,17). Additionally fixed benches also overlook the school's southern asphalt surface - (O,11), (N, 12), (P,10.5) & (Q,10). In good weather these tables, seats and benches afford sitting-on, sitting-at and placing-loose-objects-on (e.g. supporting paper that is being written on) but evidence shows that students find other ways to actualise fixed furniture. Tables, for example, sometimes afford frameworks-for-cubby-making (Image 35b), looking-out in games of chase and hiding-under. Benches can also afford lying-on, jumping-off and hiding-behind while pergola posts (Image 35a), intended as supports for vines, afford swinging-around.

Images 36 a - c. Students adapt attached objects to other purposes. a) Pergola poles are actualised as places to experience swinging, balancing and jumping (J,9). b) Furniture affords building cubbies and hiding-under (L,12). c) Large stones afford standing-on, sitting-on, looking-out, and crushing-vegetation (O,4).

Half wine barrels that are filled with soil and maintained as miniature garden barriers that direct foot traffic away from blind corners on Deepwater's northern building are also actualised for hiding-behind and dodging-around in games of hiding and chasing. A collection of smaller one-third height wine barrels adjacent to the northern sandpit (G,4) afford sitting-on but are also adapted for making-on and standing-on. These one-third height barrels are spaced less than one metre apart so also afford stepping-across and jumping-over (Image 36b). Barely-movable straw bales, wrapped in hessian to extend their usable life, also offer these affordances so student arrange them as a circuit for leaping and chasing (Image 36a).

Images 37 a - c. Jumping off and over attached objects. a) Students leap from one wrapped straw bale to another around a self-made course. b) A student leaps from a one-third height wine barrel to another (both images from Deepwater, 6 March, 2009). c) A student vaults one of the logs in what was intended to be a parkour course.

As if to balance the affordances which children improvise, some fixtures' intended affordances cannot be actualised. The northern building's wet area sinks (Image 22b) do not provide water, for example, because they are blocked with sand and some fixed furniture that is exposed to the elements sometimes becomes too hot (in summer) and too wet (in winter) to sustain their intended affordances.

The other fixtures in Deepwater's schoolyard are (i) two small timber bridges - (L,17.5) & (P,17.5) - which afford passage-across, views-along, sitting-on and construction-on, (ii) another timber bridge (H,4) that affords passage-across, digging-under, walking-over and sitting-on, (iii) three groups of four posts (Image 32a & Image 32b) that afford support-for-building - (E,3), (J,3) & (Q,9.5) - and (iv) two soccer goals that are the scoring-foci on the schools sports field.

Natural attached objects

Deepwater espouses the possibility that activity in and with nature can be beneficial so approximately 840m^2 of its schoolyard is revegetated with clusters of trees and shrubs that children planted to afford shelter, enclosure and physical support for building cubbies (e.g. Images 38 a & b, Images 40 a & b). Student participation in creating the schoolyard means that some natural fixed objects (e.g. groups of trees) define spaces that have valued affordances. For example, trees at the periphery of Deepwater's softfall mark schoolyard transitional zones - (N,7) & (J,4), define gathering points and afford visual-connection to the climbing frames and central lawn (N,9). Additionally clusters of trees and shrubs, topography and individual trees on fencelines also afford some degree of enclosure (Images 38 a & b). Large logs, stones and tree rounds are also placed individually and adjacent to one another in the schoolyard and these afford sitting-on, standing-on, climbing-on, jumping-over, jumping-off and looking-out-from. Additionally, large logs that were installed at the request of two senior students as a free-running parkour course, afford running-up-to and jumping-over (Image 36c).

Images 38 a & b. Attached natural objects. a) Sloping ground, low shrubs and a small tree afford some degree of enclosure for two boys (L,2). b) Vegetation and stones along Deepwater's ephemeral creek afford access from two directions and, for seated children, nearly 180^{0}s of enclosure (O,17).

Some smaller logs and stones are equally spaced to afford stepping but even these highly specified functions are sometimes actualised in other ways. For example, Images 39 a - c illustrate that a series of small, fixed logs potentially afford challenge and support for students who want to balance from one leg to another. Similarly, two rows of stones that define the school's ephemeral creek are sometimes actualised as objects for sitting-on, jumping-off crushing-plants-on and (as uneven elevated paths) for walking and running-on.

Images 39. a - c. Small logs afford standing-on, balancing and challenge in addition to their intended affordance of defining a pathway.

4.3.6 Climbable features

Deepwater's schoolyard includes nine purpose-built climbable features and a variety of other attached, climbable objects (trees, logs, fences around timber decking and large boxes) but it does not include other traditional equipment. Research shows that climbable features at Deepwater afford looking-out-from, passage-to-another-place, hiding-behind and hiding-in, social-gathering, jumping-from, hanging-from, swinging-on, perching-on and, of course, climbing-on and climbing-over.

Deepwater’s purpose-built climbing frames are grouped in two areas that correspond to the locations of softfall - (O,9) & (T,16). The northern group consists of three horizontal bars (each 1.3 m wide and respectively 1.3m, 1.45m & 1.6m high) and one horizontal ladder (2.8m x 1.1m x 2.1m, all measurements *l* x *w* x *h*). The southern group consists of one horizontal arch (2.8m x 1.1m x 2.1m), two horizontal bars (each 1.6m wide and 1.7m & 1.85m high), an A frame (1.8m x 1.8m x 1.7m with 4 rungs on each side spaced at 0.4m) and a pair of parallel bars (2m x 0.65m x 1.6m). The frames in both groupings are placed non-sequentially so circulation is discouraged and their sturdy forms, which are resistant to modification by students, rarely afford alternative uses. Although students cannot adapt the frames, some children modify their behaviour to actualise additional affordances. For example, *GfL* research shows that a small group of young girls who habituate the northern climbing frames actualise them for almost exclusively social purposes. Although a few children try on identities at the climbing frames, more students give their attention to climbing into old bed sheets and hessian tied to fences (Image 37b) while still others climb-on and leap-off boxes, fixed benches or platforms.

Of all Deepwater's climbable features none is as prized as one's own climbable tree. Tree climbing affords risk, vertical separation, exercise and prospect but, despite this type of activity having only a history of minor scrapes and grazes at Deepwater, staff have recently begun limiting the height of climbing activities for fear of possible injuries to children. Children continue climbing however, and there is an added frisson when teachers approach; how high is too high, what branch is too weak? Children also extend the climbable potential of small trees and shrubs by adding loose parts (e.g. Images 40a & b) and these often expand their constructors' social and material activities. For example, Gordon, an eleven year-old boy, enjoyed three weeks of unaccustomed peer-group centrality because he built a "throne" (October 31) into a small tree (Image 40a). Tellingly, when Gordon relinquished control of the throne he also lost his place in the peer group.


Images 40 a & b. Deepwater's most mature trees are only five years old but they are valued climbable features. a) This tree is too weak to support an eleven year-old boy so he has enhanced its climbable potential with milk crates (N,6). b) Students added loose branches to enhance this tree's climbing, looking-out and being-seen affordances (C,2).

4.3.7 Apertures

With one exception, apertures that afford movement-through or looking-through do not exist as built features in Deepwater's schoolyard although windows, doors and covered walkways (which fit the definition of apertures) do allow access visual and physical access into Deepwater's schoolyard. However, the schoolyard forest's immature eucalypt (E. *fasciculosa* & *porosa*), myoporum (M. *insulare*) and acacia (A. *pycnantha*) canopy produces an abundance of ground-level apertures and observations show that children regard these highly and favour them as places for building cubbies and privacy. Whilst all cubbies necessarily include an entry/exit aperture most also routinely incorporate apertures that afford looking-through (Images 41a & b).

Permeable boundaries that define perimeters at the southern and northern groups of climbable features - (S,16), (U,14) & (N,8) - include vegetative apertures that afford passage-to-another-place and semi-concealment that in turn affords observing-other-people's-business. This latter affordance is particularly useful for some children because it allows them to observe and judge the appropriateness of their entering a space (e.g. checking who is in the space during games of hide and seek). Apertures are also potentially related to learning because observations show they allow novices to observe more expert others' activities without intruding on the activities or being called on to participate in them.

Existing documentation shows that children are very aware of apertures. Drawings made as part of school development processes include tunnels and frequently show narrow, winding paths, for example, and the latter of these are designed into the school's Secret Garden (17,D) and forest (Image 10, Image 14, Image 25a). Informal interviews with students also relate stories of apertures affording shortcuts (although these are typically longer than defined paths), escape routes in games of chase and approaches in games of hide-and seek.

Images 41 a & b. Apertures afford looking-out and passage-through. a) All cubbies include apertures for entry/exit. b) Although un-necessary cubbies usually include viewing apertures such as this in the rear of an acacia (A. *acinacea*) cubby.

4.3.8 Shelters

The largest forms of shelter in Deepwater's schoolyard are the verandahs whose floors were previously described as relatively flat surfaces that afford running etc. These are attached to the external walls of buildings and are equipped with rollable blinds that afford students some protection from strong winds, rain, sunshine and dust. Each building's external walls also have designed-in recesses where students configure refuges by screening off sections with portable benches, cupboards and crates (Images 42 a & b). Typically these shelters afford privacy, refuge and prospect.

Images 42 a & b. Verandahs combined with loose parts afford microclimate, prospect, refuge, privacy, and opportunities for sociality. a) Outdoor furniture and a metal tee-pee frame arranged as a schoolyard restaurant (P,17). b) A cubby built from loose parts in the corner of a verandah (P,13).

Deepwater's schoolyard also includes one stand-alone, purpose-built shelter that affords limited microclimate, prospect, refuge and privacy. This structure, a timber gazebo (Image 20b (G,15)), is located in a busy sand pit which itself is enclosed by the two blocks of transportable homerooms and perspex screens. The gazebo affords approximately 40 percent enclosure and, because it is less than 9m^2 in area, little more privacy, refuge or prospect than the sand pit it is located in. However, the gazebo is furnished with a roof that does provide shade in summer, two benches that double as tables and two windowsills that students use as tables and shop counters (Image 12a). Consequently, despite affording little shelter, the gazebo's attractive proximity to young children's homerooms and its partial transparency are powerful invitations to explore outdoor learning that make this a hub of young children's outdoor activities with loose parts and sand.

Other schoolyard features including student-built cubbies, shady microclimates (that many students value during warm Australian summers) and nest-like holding environments created by small topographic variations and vegetation (Images 43 a & b) also afford the type of shelter more usually referred to as privacy. The third part of this chapter relates stories of the privacy that Lauren and others experienced in such places and this research shows it to be an important context for learning; those stories begin at the completion of this section however.


Images 43 a & b. Shelter afforded by Deepwater's ephemeral creek (approximately (K,17) to (Q,17) to (R,14)). a) Small changes in topography and vegetation afford, control-over-who-enters-the-space, visual and auditory connection and, access-to-loose-parts. b) From Linus's point of view the creek affords partial enclosure and what Attention Restoration Theory (Kaplan 1995, p.173) describes as a sense of "being away".

4.3.9 Mouldable materials

Most of Deepwater's schoolyard is covered either by mulch, turf or asphalt so activities with large quantities of mouldable material are constrained to designated sand pits (six in total for an area of 112m^2). The availability of water holding containers (e.g. ice cream cartons, pots and pans) allows students to gather and move small amounts of sand, water and clay to any part of the schoolyard and activities with portable quantities of mouldable materials occur almost everywhere. Observations indicate that students access mouldable materials (i) at the schoolyard sandpits, (ii) by removing mulch and excavating existing bare earth and (iii) by removing stones from the school's ephemeral creek to reveal underlying clay. Commonly, students use the clay they excavate to mould balls, small bowls (Image 44a), boundaries (e.g. Images 46b) and three-dimensional figures - activities that are suggestive of the "different representation schemes" which Trageton (2007b, p.7) suggests "plastic and constructive media" afford.

Images 44 a - c. Mouldable materials. a) Students excavate clay that affords moulding (P,17). b) Damp sand affords moulding and tunnelling (O,2) (note work-in-progress sign above the foreground tunnel entrance). c) Deepwater's largest sandpit affords access to loose parts, water and sand (H,4).

One frequently used sandpit (of $20m^2$) is located in the enclosed space between the five and six year-olds' homerooms (F,15) but Deepwater's largest (approximately $42m^2$) and most popular sandpit is easily accessible from the northern building's verandah (H,5). This large sandpit is covered with 90 percent shadecloth (although the was cloth was torn in a mid-year storm and was not replaced during the remainder of the study period) and protected from winter winds by the building to its south and sheoak trees to the north and east. As with the smaller sandpit, water and loose parts are provided (Image 44c) and these increase the affordance potential and students are able to mould sand cakes, sandcastles and other constructions as well as create tracks (Image 44b) and dig pits. Sometimes these activities are combined and groups of children cooperate to construct miniature landscapes that are connected by tunnels and sand-paths. The sandpit's size together with the availability of loose parts and water make this a popular location for children of different ages so it also affords social-gathering, collaboration and social-exchanges with other-age students (Image 45).

Of Deepwater's remaining sandpits two (approximately $20m^2$ and $5m^2$, Image 44b) are located near the boundary of the school forest - (P,2) & (O,5) and are provided with shade roofing but each is exposed to wind from all directions. In summer the sand in these relatively remote pits is usually dry so affords impact absorption that some children (who find the sandpit's remoteness attractive) actualise in rough-and-tumble activities. The less than ideal microclimates, lack of water provision and absence of storage for loose parts mean however, that these places are usually less frequented than Deepwater's larger sandpits.

Two other sandpits have no shade or wind protection and were covered over during building work in October 2011.

Image 45. Social gathering and exchange. Five, six, eleven and twelve year-old students and three undergraduate student teachers participate in and observe child-initiated sand sculpting at outside learning time (Source: Deepwater, 3 November, 2011, p.2.)

4.3.10 Water

The State of the Environment Committee (2011) acknowledges that Deepwater school is located on Earth's driest inhabited continent and Bureau of Meteorology (2014) data shows the region in which the school is located is experiencing an extended period of below average rainfall. Unsurprisingly water has special significance at the school.

Water is permanently available in Deepwater's schoolyard at two drinking fountains - (D,6) & (J,5), eight taps - (D,10), (F,15), (N,11), (Q,13.5), (M,15.5), (M,16), (M,15.5) & (M,18) and one fenced pond - (C,7). Across the year rainfall also fills ephemeral puddles - (L,11.5) & (R,12.5), an ephemeral creek and a pond which, when present, also afford students access to water.

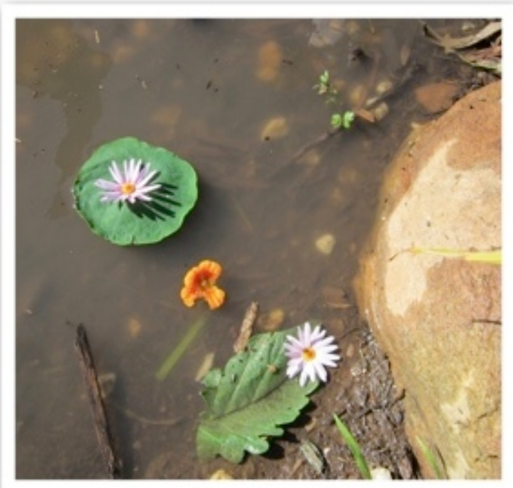
Primarily water is provided for drinking, washing and irrigation but three taps are located close to the major sandpits so students access to water for outside learning activities. Water related activities are not limited to sand pits however. Permission to use water and the availability of water-holding containers make carrying, pouring and ponding affordances available to students who mix sand and water to make mouldable blends (Image 46a) and miniature landscapes (Image 46b). Across the year, and in almost all parts of the schoolyard, students also mix potable water and vegetation in pots during pretend cooking or perfume-making (Images 47 a & b) and use the cooling affordances of water to wet hats on hot days or to wash hands, feet and faces.

Images 46 a & b. Water changes what other objects afford. a) Students mix water with dry sand to make a mouldable mixture (H,4). b) Middle-primary students carry, pour, channel and pond water to create a miniature landscape (J,18).

Images 47 a & b. Water is an essential ingredient in activities. a) Student's engage in pretend cooking (L,17). b) A completed mixture.

Deepwater also encourages students to access stormwater when it is available (e.g. Images 16 a - c) so, when parts of the schoolyard are inundated, students are able to actualise water-related affordances. These include floating-objects-in-water, sinking-objects-into-water, standing-objects-in-water, splashing by throwing-objects-into-water, stepping-in-water and, where flooding is narrow, jumping-across-water. Although students are encouraged to use inundated areas during outside learning times the school's desire to maintain its relatively flat turf for safe walking means that some activities are constrained. For example, students are not permitted to make puddles deeper by digging holes. To overcome these constraints and provide students with freer access to seasonal surface water activities, the school has sponsored construction of an overland channel and pond that conducts and stores stormwater in the schoolyard (Images 48 a & b, (R,14) to (Q,17.5) to (J,17)). Although the channel and pond typically only retain stormwater for a few days at a time the feature enriches water-related affordances for excavating, building-in-water and being-surrounded-by-water.


Images 48 a & b. Schoolyard access to stormwater. a) A channel dug in the expectation of water flowing overland (P,18). b) Heavy stones and logs carried from far afield to construct a causeway across an ephemeral pond (J,17).

Images 49 a & b. Affordances of stormwater, (J,17). a) A younger boy balances on a rock island. Sometimes his purpose was to float objects in water but at others his sole motivation was to be surrounded by water. b) Daisies (*Argyranthemum frutescens*) rest on nasturtium (*Tropaeolum* sp.) and artichoke (*Cynara cardunculus var. scolymus*) leaves in younger children's imitation of lily pads.

Adult responses to students actualising water affordances are indicative of the tensions that arise when staff feel responsible for the health and safety of students. Providing and enhancing children's freedom to explore water-related affordances demonstrates that Deepwater staff are conscious of the literature relating free, child-initiated activities to valued learning and development. The range of adult involvements in children's activities shows that staff also remain mindful both of potential hazards and parents' dislike of shoes or uniforms being wet. In this regard, permission for students to continue exploring the affordances of water and to adapt places to suit their wishes (with the proviso that children didn't get too wet) for the five years up to and including the period of *GfL* research is a further example of Deepwater's commitment to the idea that children are competent agents-in-environment.

4.3.11 Synopsis

Contemporary research and reviews such as those conducted by Blackmore et al. (2011), Ely & Pitman (2012) and Martin (2011) show that spaces and places potentially afford (i) physical and/or psychological stimulation and/or restoration, (ii) learning about social relationships and (iii) practising social skills. Few studies explore the constitutive role of relations between material affordances and learning however. This section of *GfL* deconstructed Deepwater schoolyard's potential affordances using Heft's (1988) categories but, although the research found evidence linking affordances and learning, no systematic correlations between affordance categories and learning emerged. Table 8 follows Heft's (1988) method of summarising affordances by category and illustrates that the data shows little learning-category dependence or cross-category consistency. *GfL* suggests that three factors are implicated in this finding. First, observations that are consistent with von Bertalanffy's (1968) General System Theory and Heft's (1988) conceptualisation show that each category offers multiple possible affordances. For example, climbable features are observed affording levering, sociality and skill rehearsals. Similarly, other data (**Error! Reference source not found.**, section 4.4.5) shows that a relatively flat surface and a few sticks afford Harry thirty-six different affordance actualisations in one five-minute period. In other words, the range of affordances (and potentially learning) available from a single category is indicative of multifinality[51] within an open system. Second, observations show that affordances

[51] After von Bertalanffy's (1968) General Systems Theory multifinality is "many outcomes consistent with a particular value of one variable" (George & Bennett 2005, p. 10).

are not specific to categories. Relatively flat surfaces, apertures and relatively smooth slopes, for example, are each actualised as places affording running, communication and sociality. Observations that "similar outcomes occur through different causal processes" (Bennett & George 1997, p.5) are therefore suggestive of equifinality. Third, children's activities are typically influenced by relationships between affordances. For example, Deepwater's constellation of relatively flat surfaces, relatively smooth slopes, apertures and shelters affords prospect, refuge and escape that are highly valued in children's running-chasing games. Similarly shelters, which afford children some control over who enters their space, are significant scaffolds for learning partly because loose parts, mouldable materials and water-related affordances are also available for actualisation. In other words, the actualised learning affordances are related to the system rather than an individual affordance category. Consequently, although this study finds that physical elements potentially influence what children do and learn, the observations cannot reliably relate affordance categories and learning.

Table 8. Observed student schoolyard affordance actualisations.

Environmental Quality	*Potential affordances*
Flat, relatively smooth surfaces	access-to (attached-objects, loose-objects, mouldable-materials, water, peers & staff); balancing (as a support for); bouncing, catching, hitting, kicking, rolling & throwing-balls; being-noisy; cartwheeling; chasing; competing; constructing (on); conversing; dancing; digging & ploughing; drawing (on); feelings-of-familiarity & comfort; jumping; meeting; microclimate; observing-other; privacy & control; prospect and refuge; role-playing; rolling-objects-across; running; self & collective organisation; sharing adults' business; sitting; skipping; social-gathering; talking to; tumbling; &, walking.
Relatively smooth slopes	being-noisy; chasing; competing; conversing; exploring; hiding; prospect and refuge; pushing & pulling-up; rolling & sliding-down; role-playing; running-away; running-up & down; self & collective organisation; sharing-adults'-business; sitting; sliding; social-gathering; tumbling; &, watching a leader.
Graspable/detached objects	arranging; balancing; building; catching; collaborating; competing; conversing; defining-space; designing; drumming; experimenting; games; hitting; hoarding; joint-attention; kicking; knocking down; informal-learning; making-objects; mixing;

	moving; negotiating; organising; place-making; planning; pointing; poking; privacy; role-playing; sharing; social-gathering; stacking; stirring; stitching; swapping; throwing; waving; &, weaving.
Attached objects	being-noisy; chasing; competing; conversing; defining-places; games; hiding; joint-attention; jumping-from and/or over; looking-out-from; meeting; microclimate; passage-across; performing; privacy; prospect & refuge; role-playing; sharing-adults'-business; sharing-with-peers; sitting-at; sitting-on, social-gathering; standing-on; stepping-from and/or over; storage; structural-support (for building); support (for writing, drawing & crushing); swinging; &, vaulting.
Climbable features	balancing; competing; conversing; copying; climbing; exercise; experimenting; jumping-from; hanging-from; joint-attention; looking-out-from, microclimate; passage-to-another-place; planning; prospect & refuge; risk; role-playing; separation; sharing; social-gathering; sitting; structural-support (for building); swinging; &, turn-taking.
Apertures	chasing; competing; connection; defining-entrance/exit; exploring; hiding; looking-through; moving-through; role-playing; &, turn-taking.
Shelters	being-noisy; chasing (running around); competing; conversing; building; hiding, microclimate; planning; prospect & refuge; privacy; role-playing; sense-of-being-away; sense-of-place; sharing; social-gathering; storage; &, support-for-building.
Mouldable materials	collaborating; construction; digging; engaging-with-other-age students; joint-attention; moulding; planning; pouring; role-playing; sculpting; sharing; social-gathering; soft-landing; support (for part buried posts); throwing; trenching; &, tunnelling.
Water	building in; bridging; channelling; cooling; drinking; experimenting; floating-in; joint-attention; jumping-over/in; making (e.g. pretend food & perfume); mixing; planning; ponding; risk-taking; pouring; role-playing; separation; splashing; throwing-in; walking-through; washing; watering (e.g. seeds & plants); &, wetting (e.g. sand).

This part of *Grounds for Learning* documents learning as an affordance of schoolyard activity but does not identify generalizable relations between Heft's (1988) affordance categories and learning. As such the study adds to literature that documents environments as contexts of learning but, given the observed multifinality of affordances, further analysis of learning potential by affordance category is deemed to be both impractical and undesirable. The study therefore progresses, not by "break[ing] the pattern which connects the items of learning and ... destroy[ing] all quality" (Bateson 1979, p.8), but by relating five histories of schoolyard affordance actualisations. In doing so this section concludes by interpreting *GfL*'s preceding descriptions as (i) indications of the possibilities that are developed in the next section's narrative histories and (ii) a reading of the microsystem, which the next chapter suggests, prioritises learning to learn.

4.4 Part three: Stories of self-chosen schoolyard affordance actualisations

> *"We proceed in such a way that the children are not shaped by experience, but are the ones who give shape to it"* (Malaguzzi 1998, p. 86).

4.4.1 Introduction

Research into the "intimate and necessary relation[s] between the processes of actual experience and education" (Dewey 1938/1997, p.7) has a long history but relations between learning and children's use of everyday artefacts, places and spaces have rarely been explored (Rickinson et al. 2004). Nevertheless, artefacts and places are known to be rich in information (Barker 1968) and play "decisive, animating role[s] in our collective lives" (Casey 1993, p.31) so contemporary scholarship posits systems perspectives that situate individuals in context (Bronfenbrenner & Morris 2006). Accordingly, part one of this chapter discussed the larger environment in which Deepwater's schoolyard is situated then part two described the potential affordances that are available in the schoolyard microsystem. Now, based on an "ontology of human development and learning that places *relations* between individuals and their world at the core" (Stetsenko 2009 p.126 emphasis in the original), part three explores *GfL*'s propositions that (i) affordance actualisations are related to learning and (ii) multiple levels of learning are related to perceiving continuities and discontinuities in affordances over time.

Deepwater schoolyard is configured to provoke and support experiential learning and school practices are consistent with geographies and sociologies of childhood that construct children as "competent actors capable of negotiating complex social landscapes and building relationships" (Lester & Russell 2008, p.45). The study participants are therefore expected to exhibit different learning because they have different value priorities. Maximum variation sampling informs this study's choice of embedded case study students in the belief that diversity will highlight cross-case continuities (Patton 2002). To ensure a detailed examination of learning-affordance relations this part of *GfL*'s research focuses on five students and a single schoolyard but the schoolyard is regarded as multiple spaces where study participants continually make and remake places (Gustafson 2001, Relph 1976).

Mindful that learning occurs across multiple domains and that affordance categories exhibit multifinality and equifinality, part three presently relates histories of student schoolyard learning as narratives that are based on analysis and interpretation of *GfL*'s research data. For research purposes *GfL*'s use of the term 'learning' follows Booker's (2010) definition of it as processes that support more expert participation in culturally valued practices.

4.4.2 Araceli

Araceli was selected for extended video observations because, at the start of *GfL*'s field research, she was unfamiliar with Deepwater's schoolyard and her parents and teacher agreed that she displayed value priorities which tended strongly toward (i) concern for the welfare and interests of others, (ii) seeking stimuli and (iii) accepting responsibility. These priorities placed her near the perimeter of *GfL*'s sample at (4,1). A further consideration in selecting Araceli was that preliminary interviews identified her previous experience of schoolyards as strongly contrasting with the values embedded in Deepwater's microsystem. *GfL* therefore anticipated that potentially new schoolyard experiences at Deepwater may serve to configure a transition point in Araceli's learning.

Beginning and belonging.

For Araceli, a newly enrolled nine year-old girl, Deepwater Primary School was an unfamiliar place; somewhere she'd visited just briefly. However, on her first day in her new class she recognised Kay and Yasmin, immediately recognising that Deepwater was a place for people she liked and for people like her. Being in the same class meant she could spend time with Kay and Yasmin and so, by their first outside learning time, the three girls had decided to develop a common interest by building a shelter in the schoolyard. Initially Araceli's cubby was a simple, single-celled structure of sticks and hessian tucked in amongst four trees (M,2), but, in little more than a few days the girls collective efforts extended the cubby to include personal rooms and shelving, seats and floor coverings (Image 50a).

Images 50 a & b. Araceli defines practices and a place for herself in Deepwater's schoolyard. a) Araceli, Kay and Yasmin pose in their newly constructed cubby (Deepwater, 1 March, 2011, p.3). b) A homeroom display celebrating the place mats and bracelets that Araceli, Kay and Yasmin made from sheoak (*Allocasurina verticulata*) phyllodes during outside learning times.

The cubby was more than a structure however; it was also a place for making. Through sharing ideas, cooperating and persisting with tasks the girls made all sorts of artefacts that were uncommon in schoolyards: pots were made from mud and clay; placemats, jewellery and tokens from wool, vines and leaves; and, perfumed water was scented with leaves and petals. Indeed, in just a short time, adapting the cubby and making, sharing and receiving artefacts was so routine a group practice that, aside from being physically present in the cubby, making artefacts and extending the cubby characterised cubby-group membership. The girls knew this too, for, in a movie they made about their first week in their cubby, Araceli named herself as the "Handy-Girl who put things up and fixed things" and Yasmin, the group’s "Prime Minister" (February 11), explained that each girl would keep her role for two weeks before another assumed the role. Clearly then, in addition to making, the girls' cubby afforded (i) a locus for dialogue and reflection, (ii) reasons to negotiate, (iii) things to share and (iv) affirmation that informed Araceli’s sense of worth and connectedness. Furthermore, Araceli’s having both a personal room in the cubby and a named role in the group indicates that she had successfully inculcated herself in Deepwater's physical and social milieu.

Images 51 a & b. Making, sharing and receiving artefacts are typical cubby activities. a) Cubby table covered with "Bits and bobs" that Araceli, Kay and Yasmin had made from loose parts (March 14). b) Araceli sits in the sunshine of her cubby garden and weaves with string while Kay and Yasmin sit less than 2m away.

Otherness

Araceli's cubby was a symbolic and material statement of her belonging and, although the Deepwater community valued and respected Araceli, Kay and Yasmin's cubby-making, other children who visited on weekends when the girls were not present had begun using, changing and vandalizing their cubby. As a highly valued object and locus of activity it is unsurprising that the cubby was repeatedly remade and that two girls who wanted to join the group each found ways to be useful during phases of reconstruction. Lauren, for example, spent several weeks standing close by the cubby and was quick to step in when her strength could help secure posts and her reach could drape fabric over taller branches. These contributions were eventually rewarded when Lauren was permitted to sit at the fringe of the cubby and join in collective activities. By early March however, Araceli, Kay and Yasmin's interests were increasingly self-centred and rules were invented to govern who could visit and when. Subsequently restrictions were tightened and, despite her contributing to cubby reconstructions and making artefacts, Lauren was subsequently limited to visits on "Friends-day Wednesday" (April 7). Lauren's inability to sustain participation in valued social practices by dint of creative object use cast doubts on this study's contention that shared object use was related to social learning and, had it not been an accident of history, these doubts may not have been resolved.

Dispossession and dissolution.

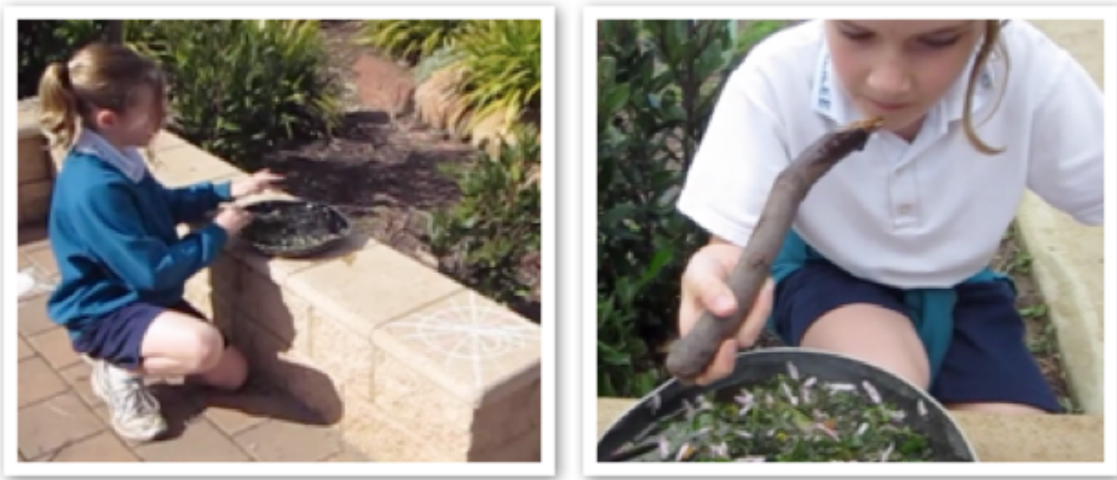
It is a contention of this study that cubby making and object use mediated Araceli's relationships but this view was tested by events that followed weekend vandalism of the cubby. Araceli's cubby had been repeatedly vandalized and reconstructed over thirteen weeks so it was surprising to discover it abandoned early in the second school term. Just the day before Kay had explained that, even though the cubby had been vandalized on the weekend, the group, which included one new member, was in the process of rebuilding it as a smaller meeting place. On this occasion however, Kay and Yasmin were sitting in a small copse some 15m south of their dismantled cubby (Image 52a) while Araceli and the new member were building a replacement in a dense thicket 8m to the east. At the time, and again a year later Araceli, explained that her group had given up making the cubby because repeated vandalism had made them wonder "what was the point of rebuilding the cubby if people were going to break it all the time?" (March 23, 2012). Araceli's immediate continuation of cubby building with another girl suggested that other factors were also relevant however, and shortly afterward her teacher explained that Kay and Yasmin had realised that they were 18 months older than Araceli and had chosen to dissociate themselves from her. Videos showing Kay and Yasmin barely responding to Araceli on the day the cubby was abandoned, and their subsequent avoidance of schoolyard activities with Araceli, also indicate that an intra-group change precipitated dissolution of Araceli, Kay and Yasmin's cubby group.

Images 52 a & b. Dissolution of a peer group. a) Araceli (far right) and a new companion realise that Kay and Yasmin (seated) will not return and reconstruct the cubby (O,4). b) Araceli walks a familiar path (M,4) but her cubby (top left) is abandoned.

Membership of the cubby group had afforded Araceli activity, relationship and security so abandonment of it was a significant challenge. Indeed, dissolution of the cubby effectively disrupted Araceli's sense of community in that she no longer felt that she mattered to others in the group or that her needs would be met by being with Yasmin and Kay. Unsurprisingly then, Araceli sought other ways and places to meet her needs. Initially she responded to displacement and alienation by trying to re-create her earlier existence with other peers in a nearby location. Later, she tried the related strategy of joining peers who had gathered in a secluded place on the other side of the school. None of Araceli's attempts were entirely successful however, so during the remaining seven weeks of second term and into the first two weeks of the third school term she literally, and metaphorically, hung around on climbing frames near her homeroom. These climbing frames offered Araceli environmental qualities that the literature recognises are important to children. They were easily accessible, afforded activities that Araceli liked and were relatively free from outside controls and interferences (Min & Lee 2006, p.59). Araceli was not satisfied with her climbing-frame existence however, and she made occasional reconnaissance circuits of the school to investigate other possibilities. She also sought to engage with and show off to staff who passed her way. In this regard Araceli's behaviour was similar to other students (including Lauren who had previously attempted to join Araceli, Kay and Yasmine's cubby) for whom easily accessible activity in the presence of peers became the default between episodes of searching for other relations. Araceli's searching was nearly over however, because the second school term was coming to its inevitable end and with a new term would come a new student and new opportunities.

Recovery

After the school's mid-year break Araceli tried to reconnect with her old friends Kay and Yasmin but within half an hour she had given up and her activities centred again on the southern climbing frames. This term there was a difference however. A new girl had started at Deepwater and, by Tuesday one week later, Araceli's focus shifted. Her behaviour had changed too. Just three minutes into that second Tuesday's outside learning time Araceli stood, waiting, on the small bridge over Deepwater's ephemeral creek. She shuffled anxiously, looking back and forth, standing first on two legs then one. Balancing on the bridge's handrail she asked if I'd seen Dakota and, when at last Dakota appeared, she ran over and stood next to her new peer. After a few words she ran again, first to find leaves, then to collect sticks and a pan. Presently both girls were making "perfume" (August 11) and when Araceli crouched over the pan filled with water, petals and scented herbs Dakota crouched too. After Araceli stirred the pan's contents Dakota stirred the contents too. And when Araceli walked a few steps to pick rosemary so did Dakota. Then Dakota smelt a leaf so Araceli smelt it as well. Finally, at the close of their first period of shared activity, when Araceli placed the loose parts she had been using under the small bridge “so no-one steps in them” (August 11), Dakota did too. Again and again over the next three break times either Araceli or Dakota would leave the other to collect resources then return with something to share and, while one was gone, the other paused her activities and watched for her friend's return. Throughout these activities the schoolyard's attached objects, abundant loose parts and visual and auditory connection afforded the pair freedom to adjust and synchronise body positions, resources and actions and in so doing it supported formation of their relationship.



Images 53 a & b. Constructing relationships. a) Open space affords movement and visual connection supports formation of a new relationship. 4b) Leaves, petals and water afford perfume making and synchronisation of intent.

The bioecological model proposes that distal elements may affect coordination and synchronisation in complex systems and, on the morning of their third day, outside forces caused Araceli to alone on the bars again. But this was no permanent disruption, Dakota was only delayed in a meeting with her teacher and, by the next break, she and Araceli were together once more. The short break initiated other changes however, and later that day and for the rest of that week Araceli, Dakota and three same-age peers made a place for themselves in the north-eastern corner of the schoolyard. The choice of a corner where “not many people visit” (August 15) gave the peers 270 degrees of enclosure and two shrubs that screened the opening further enhanced their privacy. Here then, amongst logs that served as tables and chairs, cooking pots filled with water and wattle flowers, the new companions began negotiating ways of being with each other.

Once more changes in other parts of the microsystem disrupted Araceli and Dakota’s synchronisation of schoolyard activities however, and these posed a risk to their nascent relationship. For more than five months Deepwater's senior students had moved to repeal a rule that constrained games of chase to turfed areas and, while Araceli and Dakota had been constructing their new cubby in a corner of the schoolyard, the sought-after change had been granted. Thus, at the beginning of a new week most senior students were participating in a combined game of hide and seek chasey. For Araceli this was a chance to share an activity with Kay and Yasmin so she readily joined in. Dakota, who was not as athletic as the others, might have dropped out if speed and endurance were essential prerequisites but, because the game involved hiding, she joined in too. By Thursday Araceli and Dakota had abandoned hide and seek games however, and settled in a place amongst the stones and strappy-leaved native flax of Deepwater's ephemeral creek. Ostensibly this place was well suited to the girls' activities but it turned out to be a throughway for children involved in hide-and-seek chasey and, after a few days, Araceli and Dakota moved into a more distant copse of shrubs. When asked, Araceli explained that they had chosen the new “place because there's not many people around here and it's not a chasey area ...” (September 14) and Dakota added that they had made their “own quiet place” (Image 54a). From then on, and for the rest of the third school term, Araceli and Dakota made a cubby in that quiet place and it became a locus of relationship that synchronised shared activity and attention.

Images 54 a & b. Secluded places that are preferred for cubby building also afford shared activity. a) Araceli squats at a cubbyhouse table making sheoak placemats (D,9). b) Collations of natural and made materials are the basis of cubby structures and practices (O,17).

Twice more during that year Araceli and Dakota moved their cubby, first back into the ephemeral creek (Image 54b), then to a place very near where Araceli’s experience of schoolyard cubby making had begun nearly twelve months earlier. Each time the girls took the trouble to move their new cubby had to be different from those that preceded it but each was also similar in many ways. Each cubby (i) was easily accessible from their homeroom, (ii) was a territory that offered security and control, continuity and privacy, (iii) stimulated and supported cubby making activities and (iv) structured relationships with friends and adults. When asked how these configurations of spaces and practices suited her Araceli replied that: “even though there isn't a [traditional] playground you can create your own … [and I] … feel really happy and … safe” (September 14).

Summation

Araceli's tendency to affirming relationships and interest in craft predated her participation in this study but Deepwater schoolyard's carefully constructed liminality clearly encouraged her to use and adapt artefacts, places and spaces in ways she had not done at her previous school. In her own way Araceli actualised non-prescriptive objects to create emplaced worlds where she won central roles in relatively stable peer groups. What Araceli learnt through engagement with schoolyard artefacts, places and spaces may therefore be more than specific skills, knowledge or concepts; her experiences of emplaced affordances may also have taught her about self actualisation, purpose and what Tolmie et al. (2010) discuss as mutual understanding.

4.4.3 Edward

GfL's preliminary observations showed that Edward was always outdoors during break times and, though sometimes alone, he was usually engaging with objects and places. A little younger than Araceli, Edward's parents and teacher confirmed his unique (for this sample) value priorities (1,2) while adding that he was self-directed and open to sharing. In terms of maximum variation then, *GfL* considered Edward a suitable contrast to Araceli.

Agent

When, at five years of age Edward became a Deepwater student, staff encouraged him to explore with his senses. From the start Edward liked to manipulate and adapt schoolyard elements and would happily consider how his activities contributed to the environment. During his first school year Edward planted and nurtured memorial rosemary (*Rosmarinus officinalis*) in the school's sensory garden and helped grow a forest on the school's hill but really he loved to search out small creatures in the schoolyard then care for them in class. During his early years Edward was also encouraged to consider schoolyard activity as learning so he made potions and cubbies (Image 55a), helped build sandpit machines (Image 55b) and, two years after learning about invertebrates in class, he made caterpillar farms (Image 55c).

Images 55 a - c. Edward's history of schoolyard affordance actualisations. a) At five years of age Edward proudly shows his cubby (Deepwater, 23 September, 2008). b) Six year-old Edward pours water into a "sandpit machine" (Deepwater, 3 February, 2009). c) Seven year-old Edward shows his "caterpillar farm" (Deepwater, 7 June, 2010).

By the time Edward had become an 8 year-old participant in this study it was clear that the schoolyard suited his preference for creativity, self-direction, acquiring knowledge and personal achievement. In addition, whereas Araceli's schoolyard activities were typically related to actualising affordances for sociality, the continuity of Edward's affordance actualisations was indicative of his responding more directly to qualities of the physical environment. Certainly Edward functioned competently in social contexts but his affordance actualisations also showed strong recurrent themes. His activities, including for example: see-sawing with loose parts (Image 56a - introduced in part two above); balancing on a curved piece of timber (Image 56b); and, helping operate a trebuchet (Image 56c), were all actualisations of affordances-for-levering. Other research has shown that children "can use patterns of evidence to make predictions, interventions, and even counterfactual claims" (Schulz & Bonawitz 2007, p.1045) and this is precisely what Edward did; he and other children predicted and tested what their interventions would do.

Images 56 a - c. Actualising affordances-for-levering. a) Experiencing a seesaw (March 9). b) Balancing on a bowed piece of timber (March 10). c) Helping launch softfall with a trebuchet (April 11).

Edward's history of activity also demonstrated his awareness of contextual factors and capacity to reflect on action during affordance actualisations. For example, his innovative use of a log and tree as a see-saw can be interpreted as actively responding to environmental factors including (i) being free to experiment, (ii) the potential for injury arising from how and when he might push the log, (iii) the wishes and capacities of other children and (iv) the physical realities of fulcrum height, lever length, proximity of fencing and so on. Similarly, after repeatedly dropping a length of timber so that it landed vertically Edward observed and reported that "When I drop this down it actually stands up for a while" (September 22). Whilst action, awareness and reflection are a basis for constructing scientific/abstract concepts, neither action, awareness nor reflection alone or in combination, guarantee that formal learning occurs (Fleer & Peers 2012). For example, Edward gave no indication that he generalised his experiences of gravity as Sir Isaac Newton reportedly did in the celebrated story of an apple falling. Similarly, Edward did not indicate that he associated his ability to swing on a vertical timber post (Images 57 a - c) with Newton's third law of motion. As such, Edward's affordance actualisations remind us that, whilst activity may be redolent with learning potential, learning itself “is often incidental” (Hewes 2007, p.125) and learning formal concepts most likely requires "conceptual and contextual" (Fleer 2010, p.75) framing - usually by a more-expert social other. If such framing had occurred either prior to or after the above examples, Edward's affordance actualisations may well have consolidated formal learning but considerations of how conceptual framing supports learning is a focus for other research (e.g. Andrée & Lager-Nyqvist 2013). The focus of interest for this study is the learning that arises from actualising schoolyard affordances and, in this regard, ecological psychology (Gibson 1979) suggests that Edward's dropping a length of timber (an affordance of the agent-timber-gravity system) helped him learn, or perceive, an invariant.

Images 57 a - c. Edward exerts a force to swing across a loose vertical timber and is drawn onto the timber by gravity. Simultaneously, following Newton's third law of motion, the timber exerts an equal and opposite force on Edward's hands. Actualising an affordance of timber in this way made it a Class 3 lever (Davidovits 2008, p.10) but, although Edward repeatedly enjoyed the sensation of swinging across the timber, there was no evidence that he rationalised his experience of gravity or levers as formal concepts.

Learner

Edward's affordance actualisations may have helped him perceive or "specify persisting environmental resources" (Reed 1996, p.48) such as gravity but Sutton-Smith (1995) suggests that, whilst activity may scaffold formal learning, the spontaneous informal learning related to children’s activities may be more valuable. The US National Research Council (2009, p.95) report *Learning Science in Informal Environments: People, Places, and Pursuits* discusses a similar line of reasoning and suggests that learning in non-formal settings is likely to be:

> “much more specific, more focused, and more connected to the deeply motivated interests and goals of the learner. These everyday pursuits ... [are likely to help participants] reach goals that include solving problems, increasing expertise, and enjoyment.”

As such, the National Research Council (NRC) introduces an alternative view of Edward's affordance actualisations. Specifically, whilst the NRC acknowledges that actualisations can be linked to individual environmental elements (e.g. lever-able timber), the report indicates that focussing on what is learned about the specific elements (e.g. levers) or element-related concepts (e.g. ratios) may not be productive. Rather, the NRC relates experience of affordance actualisations to what is broadly defined as problem solving - a key disposition for 21st century learning. In this conceptualisation changing the position of children on the unequal length see-saw and changing the position of his feet on a bowed piece of timber is indicative of Edward "predicting possibilities and identifying and testing consequences when putting ideas into action" (ACARA 2013, p.713). Similarly, changing the fulcrum point on a trebuchet is indicative of "analysis that uses prior knowledge and evidence when choosing a course of action" (ACARA 2013, p.716).

Actualising affordances related to proportions shows that Edward engaged with skills and dispositions that are identified by the Australian Curriculum but, taken in isolation, they are not confirmation of his learning; to show evidence of learning, changes in actualisations over time are required. Fortunately, Deepwater's practice of documenting children's outdoor learning provided some record of Edward's schoolyard activities over six years and, together with data gathered during *GfL*'s intensive research period it presents a part-history of Edward's caterpillar-related learning.

Perceiving associations

Edward's experience of caterpillars and butterflies at Deepwater began as a five year-old when he and his class raised caterpillars (*Danaus plexippus*) then, after pupation, released the butterflies. His interest continued over the next two years when, in late summer and early autumn each year, he gathered and cared for wild caterpillars from Deepwater's schoolyard (Image 55c & Image 58).

By the time of this study Edward's interest in butterflies was well developed and the eight and a half-year old knew that late summer was an opportune time to find caterpillars in the schoolyard. Thus, in early March 2011, Edward sought out and collected swan plant (*Gomphocarpus physocarpus*) leaves, one caterpillar and some butterfly eggs from Deepwater's schoolyard. Later, having discussed his schoolyard activities at home, he showed staff and students an aquarium he had bought and then proceeded to stock it with caterpillars. Inspired by Edward's activities numerous other students brought containers and began farming caterpillars. With so many farmers and a finite resource of the leaves that were the caterpillar's only food, over-harvesting soon reduced the supply of fresh leaves and, within two weeks, the system was near a point of collapse.

A double bind

Edward noticed that the swan plants were nearly stripped bare and realised there was an impending problem. With his teacher's permission he visited classes and suggested that harvesting be limited but, without constant policing, harvesting continued unabated; after all even Edward had to feed his caterpillars. This placed him in a contradictory position. How, after all, could he insist that others abstain from what he initiated and was continuing? Edward's response was that he would "save a species" (April 4) by growing new swan plants from cuttings and establishing a sanctuary.

Edward's innovation clearly showed he had perceived both the continuity of caterpillar-plant dependence and the imminent collapse of the resource. In addition, his response generated new ideas and possibilities for action in the way the Australian Curriculum suggests that students "create new, and expand on known, ideas ... explore situations and generate alternatives ... options and actions when seeking solutions" (ACARA 2013, p.708). Similarly, Edward's stated intention of "test[ing] this [planting] for the weekend" (April 4) indicated that he would be "reflecting on actions and processes ... [and] evaluate procedures and outcomes" (ACARA 2013, p.709) as prescribed by the curriculum. Edward's 2011 efforts to grow new caterpillar habitat were unsuccessful but he persisted and in 2012 he sought this researcher's help to propagate host plant seeds. In 2013 Edward also initiated and monitored a project to establish habitat refuges for caterpillars at Deepwater.

Images 58 a & b. Actualising affordances related to caterpillars. a) Edward shows the aquarium he brought from home to house swan plants, eggs and caterpillars (March 4). b) Preparing new-growth cuttings from a swan plant (April 4).

Individual affordance actualisations do not show learning but tracing Edwards's activities over time and referencing them to continua from the Australian Curriculum demonstrates a relationship between actualising affordances and learning. For example, the *Evaluate Procedures and Outcomes*[52] strand of the Australian Curriculum indicates that Edward's satisfaction "with the outcome of tasks or actions" (ACARA 2013, p.717) related to raising butterflies in class is a Level One outcome. The same strand identifies that Edward's dissatisfaction with not "accomplishing what he had set out to achieve" (ACARA 2013, p.717) in terms of saving butterflies is a Level Two outcome. Similarly, Edward's 2012 explanation and justification of (i) ideas and anticipated outcomes of propagating host plants and (ii) initiation of a programme to plant, care for and monitor butterfly-specific host plants in a newly developed part of Deepwater's schoolyard is also related to more expert engagement with ACARA content. In short, formal and informal observations over an extended period show Edward more expertly actualising affordances related to practising, analysing, synthesising and evaluating his reasoning and procedures as per the Australian Curriculum (Table 9).

Table 9. Chronology of Edward's caterpillar-related affordance actualisations compared to ACARA (2013) content, his actual age and the age ACARA expects students will have learned the content.

Observed behaviour	**Content Descriptor from ACARA (2013, p.717) *Evaluate Procedures and Outcomes* strand**	**Actual age & ACARA indicated age**
Expresses pleasure at raising and releasing caterpillars with his class (Feb 2008).	Check whether they are satisfied with the outcome of tasks or actions.	5 years 4 months, by 6 years
Gathers caterpillars and resources to personally raise caterpillars and regularly checks progress (June 2010).	Evaluate whether they have accomplished what they set out to achieve.	7 years 8 months, by 9 years
Explains the means and purpose for striking cuttings in terms of creating new caterpillar habitat (April 2011).	Explain and justify ideas and outcomes.	8 years 6 months, by 10 years
Initiates and leads group planting of caterpillar host species at school. Monitors host species for caterpillar activity (June 2013).	Evaluate the effectiveness of ideas, products, performances, methods and courses of action against given criteria.	10 years 8 months, by 12 years

52 *Evaluate Procedures and Outcomes* is a strand of the Analysing, Synthesising and Evaluating Reasoning and Procedures organising element in the Australian Curriculum's Critical and Creative Thinking capability.

Summation

Edward's caterpillar-related affordance actualisations are clearly related to more expert engagement with capabilities described in the Australian Curriculum but this history also hints at the emergence of a person for whom actualisations of physical affordances provide a means to negotiate new meanings and patterns of participation amongst individuals and environments. That is, in 2008 Edward was invited to participate in caterpillar related affordance actualisations, in 2010 he showed he was a competent agent in his own right and in 2012/13 he showed a capacity to shape his community of practice. In short, Edward had moved from outsider to insider. The next narratives examine the possibility that affordance actualisations support participation in culturally valued practices more closely and relate that learning to personal and collective identities.

4.4.4 Lauren

Lauren's teacher and parents described her as a girl who was concerned for the well-being of others but who also tended to follow others' leads. These value priorities placed her near the extreme of *GfL'*s sample (4,4) and made her a subject of interest for research. Additionally, she was the oldest student in the sample and preliminary observations had shown that Lauren, who appeared to be without a stable social group, had shown an interest in joining Araceli's friendship group.

Watching & Waiting

Lauren stood at the fringe and watched. She wanted to join in but hadn't been invited so she waited while her peers created and enlarged their cubby. For three weeks she watched and waited then eventually, through patience and close observation, she saw an opportunity. Lauren's opportunity came when Araceli, who was holding an unstable timber post and rail in place, had reached for some hessian tape then realised that she would have to let go of the post and rail to achieve her aim. However, rather than allowing the fragile framework of timber to collapse she called to Lauren for help (Image 59a). Lauren had, of course, been watching closely so was quick to gather up and pass on the hessian tape (Image 59b). She then held onto the post and rails while Araceli tried to tie them in place (Image 59c). Together these actions brought about an opportunity for Lauren to suggest that she might show how to "tie a reef knot like I learnt in scouts" (February 24) and consequently enter the actual cubby structure for the first time (Image 59d).

Images 59 a - d. Affordance actualisations expand Lauren's participation. a) Araceli is unable to hold the post and rail upright while reaching for tape to tie them in place so she asks for help. b) Lauren hears the plea, gathers and passes the tape. c) Lauren stabilises the post while Araceli ties the rail to a tree. d) Standing within the cubby structure Lauren shows Araceli how to tie a reef knot.

Lauren had not waited in vain, the combination of (i) visual and auditory connection, (ii) proximity to affordances, (iii) non-specificity of resources (unstable horizontal and vertical posts, (iv) Lauren's preparedness to actualise affordances an, (v) Araceli's attempted modification of the resources (to make them into a secure framework) had opened a possible transformation in her social participation. Moreover, this was not the only instance where Lauren's learning or "participation in cultural activities [was transformed] as a result of drawing on the affordances of the environment" (Booker 2010, p.41). On other occasions objects that proved too heavy for one girl to move on her own, tree branches that were too high for shorter girls to reach and fabric that could only be stretched by two people, also sustained Lauren's involvement in the cubby making activities. Lauren's successful strategy of watching for opportunities then helping to actualise affordances clearly gave her access to participation in valued cultural activities but it was not enough to cement her a place in the cubby friendship group. She remained, figuratively and literally, on fringe of cubby making for another week before, as Araceli explained at a later date, being asked to limit her participation to "Friends-day Wednesday" (April 7). Lauren's inability to sustain involvement in valued social activities by actualising schoolyard affordances challenged *GfL*'s basic hypothesis but such matters were not Lauren's concern, so, on being excluded from previous fields of participation, she searched elsewhere.

Constructing

Within days of being excluded from cubby making Lauren formed a loose association with three girls from her homegroup. The association was prompted the when two girls suggested they "play with Littlest Pet Shops[53]" (March 10) and made possible by two of the girls bringing some of the plastic animal characters from home. The association then became manifest when the group shared the characters and settled into a section of the school's ephemeral creek (N,17) with the intent of animating the characters.

The attractiveness of nearby places is known in the literature (e.g. Min & Lee 2006) so the selection of a place that was just six metres from Lauren's homeroom was unremarkable. Proximity was not the girl's only consideration however, the school's ephemeral creek was also chosen for the range of other affordances it offered the girls. For example, the creek (Image 60a) was sufficiently sheltered as to provide almost 360^0 of horizontal enclosure and small gaps between the rocks that defined the watercourse could be adapted as homes for the Littlest Pet Shop characters. There was also an abundance of small sticks, smooth river pebbles, long strappy leaves and mulch available for the girls to actualise as miniature roofing, bridges and flooring.

Serendipitously, choosing a linear section of ephemeral creek also had the effect of enhancing Lauren's participation in the group activities. In fact, sitting between one girl whose actions were outgoing and two other girls whose activities were somewhat more restrained placed Lauren at the centre of a web of affordances for sociality and construction. For example, Lauren's central location allowed her to (i) respond to a suggestion that straw might be used for building by passing straw across to other participants, (ii) lean over to join a conversation with the girls on her left and (iii) be heard and seen when she re-told stories of activities previously undertaken in the creek. Location also helped Lauren share and guide activities that enriched the miniature worlds the group was creating. For example, when she built a roof of sticks, straw and

[53] *Littlest Pet Shop* is a global franchise based on marketing small animal-like characters through children's toys, computer games an, animated cartoons.

stones over a gap between two rocks (Image 60b) other participants did so too. Similarly, when she suggested using fennel leaves to make soft, scented beds for the Pet Shop characters (Image 60c), her idea was enthusiastically taken up. And when she found a piece of timber, placed it across the creek, and announced "We've got a bridge" (April 10) her peers enacted walking their Pet Shop characters across. Not all improvisations were Lauren's of course and indeed most innovations were repeatedly appropriated and reproduced as collective activities regardless of who initiated the innovation. When, for example, one girl used small rocks as miniature furniture, rock furniture became de rigueur for the group's constructions. Thus it was that collective affordance actualisations and meaning making became the basis for the emergence of what Ward (1961, p.201, discussing adventure playgrounds) describes as “a free society in miniature”. Lauren and her friends did not think of themselves as a society in miniature nor did they consider that they were learning while they explored relationships through activity and group experiences[54]. Nevertheless learning was occurring and Littlest Pet Shop activities were engaging the children with elements and content from the Australian Curriculum's Critical and Creative Thinking Learning Continuum (ACARA 2013b). **Table 10** summarises the learning in relation to Lauren's affordance actualisations.

Images 60 a - c. Physical affordances place Lauren at a nexus of social interactions. a) Proximity to the homeroom, nearly 360 degrees of enclosure, rocks to sit on, gaps between rocks and natural loose parts made this place in the school's ephemeral creek conducive to Littlest Pet Shop activity. b) Lauren makes a home for her Littlest Pet Shop character in a gap between rocks. c) Two Littlest Pet Shop characters placed under a constructed roof, behind a plastic window on a bed of fennel leaves.

[54] This is a Level 1 descriptor from the *Australian Curriculum, General Capabilities, Personal and Social Capability Learning Continuum, Social Awareness, Understanding Relationships* (ACARA 2013).

Table 10. Observed behaviours and Australian Curriculum content. Lauren's chronological age at the time was 10 years and 9 months.

Observed behaviour	Content Descriptors and ACARA Organising Elements	ACARA indicated age
Explained how Littlest Pet Shop activity began.	Explain intentions and justify ideas, methods and courses of action. In *Evaluate Procedures and Outcomes*.	14 years
Searched for and trialled building materials.	Generate alternatives. In *Consider Alternatives*.	14 years
Shared and took up suggestions with friends.	Combine ideas. In *Imagine Possibilities and Connect Ideas*.	12 years
Adapted use of Littlest Pet Shop to school context.	Apply knowledge gained from one context to another unrelated context and identify new meaning. In *Transfer Knowledge Into New Contexts*.	12 years
Described how an artefact was created.	Identify and justify the thinking behind choices they have made. In *Reflect on Processes*.	12 years
Tried new, more sustainable activities.	Experiment with a range of options when seeking solutions and putting ideas into action. In *Seek Solutions and Put Ideas Into Action*.	10 years

Lauren and her friends actualised affordances in Deepwater's ephemeral creek for fun, not for the learning that was part of their activity. The experience of negotiating, rehearsing and re-creating meaningful processes of collective knowing and doing through Littlest Pet Shop affordance actualisations had significant implications for the girls' learning however. Specifically, their Littlest Pet Shop-related affordance actualisations over one three-week period mediated each girl's social participation so that they came to think of themselves as a group. At this time Lauren's family life was in a state of change and there were occasions when she was not at school, nevertheless the strength of the group was such that, even when Littlest Pet Shop activities ceased because school staff decreed that objects could no longer be brought from home, the social group survived and thrived. For example, in the month after they enacted Littlest Pet Shops Lauren and her friends tried out other ideas and possibilities for participation that included: sand moulding; chasey; cubby making; and, indoor card games. Later, the group gravitated to the school's climbing frames where they talked, showed each other turns, dismounts and vaults, then talked some more. It was while observing these activities that one of Lauren's peers informed me that together the girls were called "The

Four Amigos[55]" (June 28) and thus the participant confirmed that, from her point of view, a group had indeed been consolidated.

Constructing sociality

Some months later the Four Amigos abandoned their climbing frame pursuits and became, outwardly at least, committed participants in ballgames. Each outside learning time for more than a full month the group reinvented ways to throw, catch, roll and bounce balls. Nevertheless, despite spending so much time actualising ball games research shows that neither these activities, nor indeed the activities that preceded them, became a personal interest for Lauren or the other Amigos. Personal interests are known to develop through four phases (Hidi & Renninger 2006, p.114), viz:

1. Externally triggered situational interest;
2. Psychologically maintained situational interest that relies on externally supported meaningful action;
3. Emerging individual interest that is increasingly self-generated but still needs external encouragement; and,
4. Well-developed individual interest that values sustained participation in the relevant field.

Lauren's interest in ball games stalled after only two phases however. Research shows that her interest was (i) sparked by environmental factors that included an interesting and varied homeroom daily fitness program, same-age peers using netballs at break times, easily accessible resources and, her successful participation in a out-of-school hours netball competition. In addition it shows (ii) her meaningful involvement was sustained through social activities and successful participation in an organised netball competition. However, it also clear that, even if Lauren had experienced an emerging interest, Lauren's interest did not become well-developed because her participation in ball games ultimately waned and, as summer days grew warmer in the last month of their school year, the Four Amigos took to skipping and then to activities that could be undertaken in the shade and indoors.

Summation

Although Lauren's changing activities suggest that personal interests may not be a factor in her affordance actualisations, an alternative interpretation is plausible. That is,

[55] The name references the 1986 movie *Three Amigos*.

rather than considering Lauren's actualisations of affordances with balls, Littlest Pet Shops and cubby making as externally triggered interests, this study suggests that her affordance actualisations are consistent with a well-developed individual interest in actualising sociality. In this interpretation, activities such as throwing a ball, animating a plastic character and building a cubby are each actualisations of the same affordance - an affordance for sociality. This is to suggest that Lauren actualised emplaced activity with peers, artefacts, places and spaces as a means to afford social relationships. Research showing that, despite an inauspicious beginning, Lauren sustained social participation in the Four Amigos beyond the immediate contexts and reports that Lauren maintained her interest in actualising affordances for sociality for at least two more years, seem to support this view. Thus, from this perspective, *GfL* suggests that Lauren actualised artefacts, places and spaces as psychological, social and material tools to mediate social participation.

4.4.5 Harry

Seven year old Harry was selected for *GfL*'s study because his parents and teachers described his value priorities (3,3) as balancing (i) personal self-confidence with a willingness to value others and (ii) self-directed stimulus seeking behaviours with a capacity to follow rules, be organized and be self-disciplined. That is, Harry was chosen for study because he was a younger, competent child who:

> “was very comfortable at Deepwater; [even] before he started [school] … he greeted any teacher he saw … he loved joining [his sister] in class … and always chatted with [the principal] when we arrived. Deepwater was always his school …” (Harry’s mother, personal communication, March 1, 2013).

Documentary evidence pre-dating this study and unstructured interviews with Harry's mother and Deepwater staff also indicate that, from the time he started school, Harry’s schoolyard affordance actualisations showed confidence and a tendency to explore. Conversations with students who participated in Harry's early affordance actualisations also confirm that Harry chose the locations and arranged materials for activities. Similarly, photographs from the period indicate that Harry and friends felt confident both in having a place of their own (Image 61a) and moving beyond it to explore the schoolyard and gather resources (Image 61b). In all then, the available evidence suggests that, by the age of five, Harry was a competent actualiser of at least some of Deepwater’s schoolyard affordances.

Images 61 a & b. Signs of early competence. a) The schoolyard place that five year-old Harry and friends made and used. b) Harry (centre) and friends explore the affordance possibilities of their schoolyard.

The centre of activity

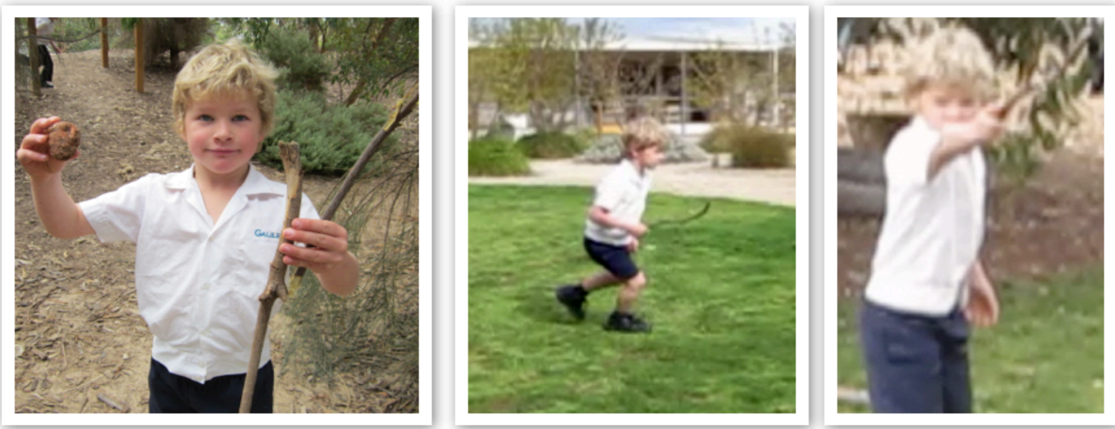
From the time he started school Harry had been an ardent actualiser of schoolyard affordances and his enthusiasm continued undiminished throughout the period of *GfL* research. In early March, for example, Harry and five friends collected timber offcuts then gathered at a log bench near their homeroom where they proceeded to enact guitar performances (Image 62a). With camera in hand, I videoed the performance and Harry smiled and performed with greater gusto when he noticed I was recording him (Image 62b). Presently however, Draco, one of Harry's friends, stood and played his timber offcut as though it was a violin and, not to be outdone, Harry stood and began playing violin too. While the group performance continued Draco edged closer to the camera and, once again, when Harry saw that his friend was taking the limelight, he smiled more broadly than before, moved closer to the camera and give a spirited solo performance that upstaged all his peers (Image 62c). Clearly, whilst Harry was performing for the camera on this occasion, his performance showed both a great deal of confidence and that his peers' accepted Harry's leading role in the group.

Images 62 a - c. Schoolyard objects and spaces afford collective activity. a) Timber offcuts are props for a guitar-band performance. b) Harry responds to being observed. c) Adding a twig turns the timber offcut into a violin.

Recognising the meanings of things

Harry's actualisations of material affordances continued through March and beyond but in a new form - re-enactments from popular stories. And throughout these re-enactments Harry took centre stage as the lead character, Harry Potter. No doubt being the lead aided Harry's participation but schoolyard affordances also supported both his and his peers' competent engagement in the re-enactments. For example, Harry chose an unusually coloured fist-sized stone because, in his mind and for his friends, it resembled the "philosopher's stone" (March 7, Image 63a) and sticks as props because their dimensions resembled those of the broomsticks and wands he imagined. Consequently, when Harry ran astride a stick of about one metre in length it afforded understanding that he was flying-on-a-broomstick (Image 63b). Similarly, when he pointed a shorter twig at a person while showing a determined expression, the twig afforded the interpretation Harry-is-casting-a-spell (Image 63c).



Images 63 a - c. Materiality supports interpretations of meaning. a) Harry shows his "philosopher's stone", "Nimbus 2000" and wand (March 7). b) Running astride a stick affords recognition that Harry is flying. c) Harry's stance, expression and wand afford the interpretation that he is casting a spell.

For this researcher, Harry's actions make clear that perceivable similarities between activity props and the artefacts they represent assist observers to interpret meanings and engage in collective activity. Other examples relate similar material-meaning relations but show that relations are multiple and complex. For example, a detailed review of five minutes of Harry's May 9th affordance actualisations shows that in one place four affordance types (relatively flat surfaces, attached objects, loose parts and structures) and, of course, time also supported his competent interactions (**Error! Reference source not found.** and Table 12).

Table 11. Actualised affordances for sociality observed during five minutes of Harry's self-chosen schoolyard activities (9 May).

Acts on communication, calls to other, chases social other, collaborates to reconstruct objects/structures, competes with social other, displaces activity onto physical object, elaborates existing valued cultural narratives, elaborates existing valued cultural practice, elaborates peer communications, explains to social other, follows social other, helps social other, ignores distracting others, jumps toward/away, instructs social other, listens to social other, locates self relative to social other, looks from, glances at/makes eye contact with social other, performs for social other, performs with social other, reports interpretation, responds to adult scaffolding, responds to social other, shares collective intent, shares locus of activity, shares personal/collective interest, sits with social other, smiles at social other, spins/ turns to face social other, takes turns, visual connection (to social other), and waits for social other.

Table 12. Process tracing forty-eight seconds of Harry's affordance actualisations, recess, 9th May 2011. Actualised affordances are italicised.

Time	Harry	Microsystem	Interpretation
11:00:00	Prior to outside time the peer group has agreed that "Harry Potter" will be the theme for their activity.	Pergola area outside Harry's classroom.	Time to *converse* and *co-ordinate-activity-with-peers* while indoors.
11:00:42		Students *exit* their homeroom and one of Harry's friends *stands* on a bench just outside the classroom door while *spinning* around a pole. He is *looking-out-from* the bench while *waiting-for* Harry**.**	Bench affords *visual connection* with doorway. Post affords *stability* & *spinning*. Combined both afford *waiting/watching***.**
11:00:48	Harry *exits* the classroom, breaks into a *run* across a relatively flat surface while *looking-across* to the place where sticks are piled ready for use. Harry *hears* his friend call. He sees his friend and *turns* to *run-along* the top of a bench, *jumps-across* a 1.2 m gap to the next bench and *stops* where he is *close* behind his friend, i.e. Harry *moves-toward* his friend.	Harry's friend *sees* Harry *leaving* through the classroom door (aperture). Friend *calls* twice "Harry Potter! … Harry Potter!"	Space/openness affords *visual* and *auditory-connection***,** *receiving and giving-communication, running & jumping.* Elevated *view-from* attached object affords *visual-connection.* Combined afford *coordinating-actions-with-a-peer.*

Harry's re-enactments of popular stories demonstrate that children actualise artefact-related affordances in two ways: (i) primary affordance actualisations realise an action possibility, or *what* may be done (e.g. jumping-across) and (ii) secondary actualisations afford information about *how* activities should be interpreted (e.g. waving-a-twig affords interpretation as the-waver-is-casting-a-spell). In terms of the latter, the literature describes perceiving action-meaning within the flow of an activity as an affordance (Robbins 2007) and *GfL* proposes that actualising this affordance during schoolyard activities may be related to higher-level learning. Evidence relating to of this type of affordance actualisation is therefore discussed in *GfL*'s next chapter.

Places of struggle and refuge

Months after re-enacting Harry Potter stories, and throughout the southern hemisphere's winter, Harry and friends were part of a school soccer team; on weekends they enjoyed contesting matches against teams from other schools and on weekdays they ignored the lawn near their homeroom (where soccer was prohibited) and walked past shrubs, trees and the school's creek to the soccer pitch at the southernmost point of the school. There, the children were quick to organise themselves into groups and begin matches that extended across both break times. Sometimes they shared the pitch with two other games but there were few territorial conflicts, the space (150 m^2 per person) after all, afforded some choice over when and where one would engage with the ball or other people. Some children, for example, chose to patrol open spaces in the hope that a hefty kick would send the ball in their direction while others, Harry amongst them, enjoyed swarming around the ball and contesting possession. And so, throughout that southern winter, Harry and friends tirelessly pursued a round ball.

During matches the soccer goals were places where one decisive kick could turn a game so goal squares sometimes became congested spaces of struggle where each individual, Harry included, was intent of gaining or denying the opposition an advantage. Occasionally too, they became sites of discord. And so it was, on one such occasion (September 16), that Harry's friends did not acquiesce to his wishes as they usually did. Harry's response was to leave the pitch and return to familiar settings where distance would separate him from the source of his anxiety and building activities could re-validate his agency.

Configuring sociality

Harry's actualisation of a favourite place for emotional regulation shows that he was aware that physical affordances could help regulate interactions with peers. Physical affordances did not always support his intentions however. Around the end of the soccer season Harry and friends returned to schoolyard and, initially at least, the only difference was that Harry had transformed himself into Anakin Skywalker, Star Wars hero. In many ways Harry's activity was remarkably similar to earlier episodes; he was the leader of an intrepid band that overcame (imagined) obstacles put in his path by powerful enemies. In time however, Harry's activities changed and the change coincided with a member of his family beginning an overseas tour with the Australian army. Whereas Harry had previously built cubbies his new intention was to build a small secure base, a refuge where he alone could vicariously share experiences with his relative on active service (Image 64a). Harry's base was near the school's central lawn so he was visible to a passing parade of students and it was not long before two boys asked what Harry was doing, and then, if they could join in. Reluctantly Harry agreed. At first he only allowed them to help gather resources. Then he made a concession; three people could share his refuge. That turned out to be too cramped however, so more concessions were made and presently Harry's intended individual pursuit had become a lightning rod for collective activity. Though somewhat at odds with his intended purpose, making a cubby set off a new phase of shared activities that included creating a campsite and, with guidance from a scouting book he'd brought from home, a (pretend) cooking fire. Thus, by December Harry's year had turned full circle and he, together with his group of friends, was once again actualising loose part affordances in social activities.

Images 64 a & b. Affordance actualisations attract and help sustain peer interest. a) Harry tries to create a place to occupy on his own (November 14). b) Harry searches for a campsite, scouting book and fuel for a pretend fire hand (November 28).

Summation

Harry’s story of schoolyard competence and engagement is far removed from stories of boredom and alienation that are common in traditional schoolyards (Evans 2001, Moore & Wong 1997). Unlike his peers in traditional schoolyards, Harry was a maker and a doer who relished adapting functionally non-specific objects and spaces as his intent, his capacity, and environmental opportunities made it possible. Only in ball games did Harry follow pre-determined rules and only once did he use manufactured objects in the way the designer had intended. Harry's affordance actualisations were rarely ends-in-themselves activities and they almost entirely functioned as passports to fun and shared experiences with valued peers. When Harry chose to actualise a timber offcut, for example, he did so specifically because the offcut's physical form helped peers interpret it as a guitar. Similarly, Harry used other resources to help configure a world that would support his competent being. Perhaps then, like Dylan Thomas (1992, p.17) who reminisced that as a child he “could explore [his local park] one day… yet still the next day, it remained as unexplored as the Poles …”, Harry’s activities were not actual explorations of some external world that pre-existed him. For this observer at least, they seem more akin to what Hedges (2010, p.33) describes as ongoing inquiries into how one might “make sense of [one's] world to lead an interesting, fulfilling and meaningful life”. The possibility that children's affordance actualisations may be related to such dispositional learning is elaborated in the following narrative and discussed in the subsequent chapter. At this stage it is worthwhile noting however, that Harry's story does suggest some young children are able to perceive and actualise meaning-related schoolyard affordances.

4.4.6 Linus:

Linus was a newly enrolled six year-old boy whose parents and teachers believed that he prioritised self-conserving and self-enhancing values (0,5) - evaluations that recommended him for *GfL*'s maximum variation sample. He was also Araceli's younger brother and, for this reason, some thought was given to not selecting him for GfL research. Ultimately a decision was made to set this concern aside and Linus was selected on the basis of (i) the unique position he occupied in *GfL*'s values distribution, (ii) his being younger than any other selected child and (iii) his minimal experience of Deepwater's schoolyard.

Instrumental activity

Early observations were glimpses of Linus as he moved freely and frequently between places, peers and activities. As a new student finding his way, Linus ranged widely while exploring Deepwater's schoolyard and, without careful searching, he was easily missed. Indeed, during his first two months in Deepwater's schoolyard, movement was Linus's defining characteristic. Eventually that changed, but not before Linus learnt a new skill that would become a powerful part of who he was and how he presented himself in words and actions.

Observations from the time when Linus learnt the skill record that he was seated on the ground a few metres from Darren who was breaking small calcite stones with larger rocks. Although Linus had tried, he couldn't break any calcite so he asked Darren "How do you get the crack?" (March 24) and Darren had demonstrated a workable stone-breaking technique (Image 65a). Records also show that Linus was trying out the technique (with some success) but that, moments later, he was called to class and that it was another four months until he rehearsed the skill again.

In spring of that year Linus returned to crushing stones and vegetation with rocks. Initially he crushed and ground calcite minerals to release a dust that he said had magical properties (Image 65b), then, as spring progressed, he began gathering and crushing berries, flowers and scented leaves to make perfume (Images 66 a & b). Still later, Linus experimented with combining crushed mica, quartzite and leaves.

Images 65 a & b. Linus actualises affordances for crushing with rocks. a) Linus (facing away) learns how to "crack" calcite (March 24). b) Linus crushes calcite to make "smoke" (September 24).

Images 66 a & b. Crushing vegetation. a) Linus mixes vegetation and water. b) Linus described nearby students and passers-by who took an interest in his activity as "friends" (October 28).

In hindsight some observers, including Linus’s parents, suggested that he had become "fixated" (FL 2012.08) on crushing-with-rocks and this view was consistent with Linus's later Asperger’s Syndrome diagnosis. However, whilst records of Linus’s affordance actualisations reveal much repetitive, ends-focussed activity that is consistent with Asperger’s and a poor fit with understandings of play (Pellegrini 2009), the literature on play also draws attention to potentially revealing aspects of Linus’s crushing-with-rocks. In particular the literature suggests the possibility that “common interest in an activity [has] a key role in bringing individuals together” (Baines & Blatchford 2011, p.270). This effect was observed repeatedly with other students and there were occasions during crushing-objects-with-rocks that Linus demonstrated social tendencies. For example, while crushing objects with rocks Linus occasionally (i) adjusted the space to accommodate others who also wanted to participate, (ii) offered advice and shared resources with others and (iii) moved locations to better observe others. Despite these concessions, Linus’s activities continued in parallel with social others and the object of his activities remained crushing-with-rocks.

Other rare instances also showed a similar pattern where Linus focussed on material affordances to the exclusion of other possibilities. Prior to this study, for example, the practice of balancing-on-planks had been established at Deepwater (Image 67a) and, in Linus’s sixth month, he and a peer tried something similar. The peer placed a piece of timber over a cable spool and tried to balance on it with Linus's help (Image 67b). Linus was inspired to try and synchronize his behaviour with that of his peer but, despite trying several balancing methods, the pair were unable to achieve equilibrium. Unable to balance, Linus ignored any possibility for sociality and moved on.

Images 67 a & b. Balancing opportunities potentially afford sociality. a) Balancing on short timbers was established as a legitimate schoolyard activity prior to *GfL* research. b) Linus tries synchronising his activity with that of a peer (July 27).

Much later in the year another opportunity for sociality arose during schoolyard activity but again Linus did not actualise it to stabilise social interaction. The opportunity emerged when Linus buried one end an upright stick in sand and attempted to give the whole construction greater solidity by wetting the sand at the base of the stick and Lucy joined in (Image 68).

Image 68. Shared activity potentially affords sociality. Without speaking Lucy and Linus arrange water, sand and leaves around the base of a stick.

Once the stick was stabilised Lucy began decorating the damp sand with leaves but Linus seemed to not notice and, while continuing patting the damp sand, he called to another asking "How is it looking?" (November 3). Then, as if it were the most natural thing in the world to mention, Linus announced loudly that he "would never enjoy being kidnapped". Soon after, he ran off with a small container then returned with it full of water and proceeded to pour the water onto the sand (being careful not to splash Lucy). Then, when Lucy dusted dry sand onto the wet patch, Linus did too. Similarly, when Lucy brought leaves to arrange at the base of the stick Linus arranged leaves too. But, even though Lucy twice tried to initiate dialogue, Linus did not speak so both continued silently interpreting and responding to the artefact as if it was "imbued with meanings" (Vygotsky 1934/1978, p.103). What's more Lucy and Linus continued making their artefact without speaking until they were called inside for lessons. Later, when Linus returned to this activity, he was alone and it was clear that his object-focus had, once again, only temporarily stabilised opportunities for sociality.

Although Linus's history of missed opportunities for sociality was a puzzle for this research it was also clear that his focus had consistently been actualising primary affordances - for example, crushing-with-rocks, balancing or keeping-a-stick-upright. Fortunately, Pellegrini and Huo (2011) discuss the role of object use in achieving peer group centrality and their work is insightful here. Their research finds that non-instrumental object use "predicted peer attention and peer group centrality" (Pellegrini & Huo 2011, p.244) and this suggests the possibility that Linus may not have been able to attract or sustain peer attention because his affordance actualisations were instrumental. To test this possibility *Grounds for Learning* analysed fifty-two of Linus's object-related affordance actualisations and found that:

a) Eighteen were instances of construction with objects (e.g. making cubbies or towers from sticks and fabric);
b) Twenty seven were instances of using objects as tools (e.g. using rocks as hammers and anvils, or using containers and plastic bags to transport/carry liquids);
c) Four were instances where Linus explored what an object would do (e.g. discovering rocks crush stones and leaves float in water); and,
d) None were instances of non-instrumental object use (e.g. imagining or inventing novel uses for objects) (categories adapted from Pellegrini & Huo 2011).

This study interprets these findings as explaining why Linus's actualisations of rock crushing did not sustain peer interest whilst Araceli, Lauren and Harry were able to stabilize peer relations with similar affordance actualisations. That is, for most of the year Linus focused on instrumental activities to the exclusion of innovative actualisations that might attract and sustain the interest of other students. Such reflections were beyond the scope of Linus's consideration however, for, by the last month of spring, he had learnt to be a lone, emplaced, and, as Linus's reaction to the subsequent disruption of his crushing-with-rock activities suggested, a contented actualiser of affordances for crushing-with-rocks.

Replacement

Linus's contentment was challenged in the first week of November when observations record him storming across Deepwater's central lawn in the direction of his homeroom. Linus's gait and expression made clear that he was very upset and, when he noticed me, he veered sharply in my direction, tears rolling down his cheeks, and called: "She is being a bully!" (7 November). As he approached he continued: "I was only crushing crystals", and claimed that the teacher[56] who was not letting him crush crystals was "being unfair". Arriving beside me Linus expressed hopes that I would "deal with it and then I can get back to breaking crystals".

At the time I wondered if Linus's strong reaction was indicative of the important role crushing-with-rocks played in sustaining his sense of self but my immediate response was to reply that I would talk with the teacher. Then I asked what he would do in the meantime. To my surprise Linus quickly indicated a small copse of bushes at the edge of the lawn (N,6) and he replied, "Build there!" (November 7). He then jogged off, but, on seeing that a younger boy was already in the copse he turned and asked "What's that boy's name in there?" I introduced Linus to Charlie and indicated that Linus hoped to build in the copse. Then I stood back. The boys stood speaking in the copse and, in a few moments, Linus had set aside his disappointment at not being allowed to crush-with-rocks and was optimistically attending to the possibility of building a cubby. As research later showed, Linus was right to be optimistic because he was on the cusp of his longest single phase of joint social activity for 2011. Presently however, both boys emerged and Linus reported that: "He (Charlie) and his friends and me are going to make friends by working together to build a cubby in here." Then Linus watched while Charlie ran across the lawn to recruit his friends.

Linus clearly believed that making things together was what one did to make

[56] Reflections and insights from teachers were included in *GfL* data and guided ongoing observations. In this instance Linus's teacher was kept updated on his schoolyard activities and, to support his apparent progress, the teacher ensured that Linus was promptly released for outside learning each day.

friends so perhaps he, like Mergen (2003, p.655 following Heidegger 1889-1976), equated a sense of identity with a capacity to make. Certainly, as days became weeks, Linus's cubby making showed all three hallmarks of stimulating and sustaining an emplaced identity (Korpela 1989).

First, cubby making resembled nest therapy (Tyrer 2002) in that it allowed Linus to adapt the environment to suit his values and beliefs and, thereby, his existing conceptual system. For example, from the very beginning when Linus answered my question about being included by others with: "He didn't include me, I included them!" (7 November) there was an indication that Linus expected others to fit in with his wishes. Significantly, Charlie and the other children did fit in. For example, they (i) attended to the rules that Linus wrote and posted by the cubby entrance (Image 69a), (ii) called Linus "boss" and "king" (November 7) and (iii) listened when Linus spoke to them as though they were an audience. Linus explained that he wasn't "bossy though" (November 17) and insisted that he was using:

> "a nice *polite* voice … because I'm a *polite* boss. Because otherwise they wouldn't want to do, like if I said (aside to Ron) I'm not going to say this to you for real Ron, I'm just gunna say it for the tape … If I was to say to Ron (aloud) 'RON DO IT RIGHT NOW!' … he would probably say "No"… because they're more likely to do it if I go *may you please do it* ..." (November 17).

Images 69 a & b. Linus's cubby realm. a) Linus identifies who and what the cubby is for by fixing a sign next to the entrance. b) Apertures allow "King Linus" (November 7) to monitor who is doing what near the cubby.

Second, actualising affordances for cubby making enhanced Linus's self-esteem by supporting an emplaced identity as king or boss. Identity is "shaped by the experiences we have with … the people and places that we encounter" (Devine-Wright & Clayton 2010, p.267) so when, for example, a passing teacher asked Marcie and Pattie what sort of ways Linus bossed them and they replied "Good sorts of ways" (November 17) Linus's identity as king was affirmed. Similarly, Linus's self esteem was supported when other children sought his permission to join the group and when they followed his instructions. A further indication that Linus believed himself to be successful and valued was his asking that I take a picture of him in his cubby and then offer it for publication in the school newsletter (Image 69b)

Last, making and inhabiting the cubby also helped Linus optimise his pleasure/pain balance. For example, actualising the affordances of attached objects, loose parts, climbable features, apertures, and shelters afforded Linus:

a) A place of refuge where he had some control over who entered his cubby and what they did while there;
b) Opportunities to experience agency both with objects and as a leader of a peer group; and,
c) A super-ordinate goal that was "needed over and above contact and proximity to bring about integration and cooperation" (Baines & Blatchford 2011, p.270).

Return

Linus's spring of contentment continued for two weeks but the beginning of the end was closing in and it came in the form of a directive from school leadership that all works-in-progress should be tidied away. Packing away at the end of each week was normal practice at Deepwater but Linus's group had previously been granted an exemption and this meant that they had retained possession of their cubby from one week to the next. On this occasion though, there were to be no exceptions, so the cubby was dismantled. In the following week older students claimed the small copse, which had been Linus's domain, and Linus's group moved to the eastern flank of the small hill some 15m away (M,3). A knee-high shrub defined one side of this new cubby and two small trees provided shade but none of these offered the inhabitants any privacy. Linus and his peers were also unable to improvise any degree of enclosure because older children, who were building bases nearby, had secured many of the resources. Nevertheless, Linus's group tried to inhabit their exposed and impoverished position as they had previously inhabited their copse. Linus, for example, experimented with sound by striking a metal pan with a variety of sticks and stones (Image 70a). However, the impoverished and exposed cubby did not provide sufficient enclosure to protect the inhabitants, their activities or their resources so Linus's group came into conflict with others. Ultimately, the closing phase of Linus's cubby building arose from a conflict over ownership of a single container lid. Initially Linus strongly defended his ownership but he later agreed to share the lid when the other group proposed amalgamating cubbies and resources. At the time I was fearful that amalgamation would undermine Linus's concept of cubby habitation, his sense of identity and the satisfaction he gleaned from each of these but, when I asked him if he wouldn't rather be the leader of his own cubby, he replied hopefully that "It doesn't really matter if you're the boss or not, it matters that you have fun" (November 28). Linus's hopes were misplaced however, and, by the afternoon of the next day, he had been displaced from the amalgamated group and was trying to define a new space adjacent to the schools northern fence (Image 70b, K,2).

Images 70 a & b. Sociality fails in impoverished conditions. a) Linus explores the ringing sound pots make when struck with sticks (An innovative affordance actualisation at last!). b) Linus, alone and dispossessed of the shelter and artefacts that helped sustain younger children's parallel activity.

Summation

Linus had been king of an emplaced cubby that afforded climbing, manipulation of loose parts, passage and views through, microclimate and privacy. In combination, these primary affordances had sustained and mediated his activity with mostly younger children but Linus's new place had no resources save space and visual connection. With nothing to do, the young children drifted away while Linus tried to establish new a cubby. Once, an older girl helped Linus move some branches. Another time someone shared a few twigs. Ultimately though, "the fragility of a self built on individualistic intentions became painfully obvious" (Csikszentmihalyi & Rochberg-Halton 1981, p.101) and Linus began looking elsewhere. So, in the closing days of the academic year, Linus led three younger children to the creek where he had first learnt to break calcite. This time however, Linus went with the idea that he would teach the children how to make perfume by crushing vegetation with rocks (December 5). Linus, it seemed, had apparently learnt to pay attention to affordance actualisation as a means to provoke younger children's interest.

4.5 Synopsis: Stories of self-chosen schoolyard affordance actualisations

Deepwater Primary school was established in a transitional time-space between existing modes of education and imagined possibilities that made creation of an influential schoolyard possible. Part one of this chapter relates how the denominational body which sponsored Deepwater, together with the school's staff, students and community, aimed to bring forth emplaced expressions of (i) the environment as an educator, (ii) children as learner-agents and (iii) teachers as responsive co-constructors of learning environments. Additionally, it shows that, through individual and collective dialogue and action, the school imagined and began creating an enriched and revegetated schoolyard where liberated, capable learners were encouraged to initiate and sustain activities that were uncommon in other schools.

Part two of this chapter deconstructs Deepwater's schoolyard using Heft's (1988) affordance categories. Reading and description of those affordance categories indicates that the schoolyard is comprised of polymorphic places and resources that sustain a multifinality of potential affordances and learning. Results also show that the arrangement of affordances relative to one another significantly influences action potentials.

In part three of this chapter stories of schoolyard affordance actualisations show that children are interested in *what* they can do with Deepwater's objects and artefacts, spaces and places. Some children build cubbies, some make miniature worlds and others rehearse actions with objects. These activities are often directed to specific ends but, sometimes intuitively and sometimes consciously, over time they also serve to reconfigure each child's experience of the microsystem. And those experiences mediate other ways of being with friends and schoolyard resources. That is, experiencing and perceiving successful affordance actualisations teaches children *how* to effectively participate in the schoolyard's microsystems. Linus's story moves, for example, from ends-in-themselves affordance actualisations to actualising the same primary affordances for a secondary benefit. Additionally, double binds occasionally show learners *where* their particular microsystems may be unsustainable and so prompt learners to enlarge their participation to include other mesosystem elements. Lauren, for example, gave up actualising Littlest Pet Shop affordances and she included ballgames in the repertoire of her activities so that she might maintain sociality. This, of course, is an *outcome* of affordance actualisations that is, to some extent, documented in the existing literature. The *processes* by which affordance actualisations support learning are poorly documented in the literature however, so it is to considerations of process that *Grounds for Learning* now turns.

5. Discussion

"We make sense of experience by generalising, and could not function without doing so. ... Yet experience itself is of the specific, and each of us is an individual with a need to see ourselves in a unique set of relations, as well as in general ones. This need is not met in a homogenising world, and many aspects of our life ... are evidence of unfulfilled cravings for personal identity set in a distinctive environment" (Seddon 1997, pp.113-114).

"The landscape also changes, but far more slowly; it is a living link between what we were and what we have become. This is one of the reasons why we feel such a profound and apparently disproportionate anguish when a loved landscape is altered out of recognition; we lose not only a place, but ourselves, a continuity between the shifting phases of our life" (Drabble 1979, p.270).

5.1 Introduction

Clarke (1989) describes a current in the history of Western thought that flows from ancient Greece to Christian theology and contemporary science; a current given voice in John Donne's (1624/1839, p.97) observation that “No man is an island, entire of itself; every man is a piece of the continent, a part of the main …” and, centuries later, by George Seddon and Margaret Drabble who write that individuals' relations are part of a larger ecology that contributes to who people are, how they feel and who they might become. Places, write Seddon and Drabble, have special meanings for humans, meanings that are related to the flowing, shifting phases of life. Places are significant for children too, as Freeman and Tranter (2011, pp. 204 - 205) remind us:

> "The physical form of places in which children live and the buildings that they use matter. Physical form influences children's ability to socialise, their health, access to services, the well-being of their community and neighbourhood, their access to play spaces, independence, safety and their ability to enjoy their childhood"

Grounds for Learning's discussion joins these and a history of other authors by exploring how experiences of schoolyard places influence children's learning and, in so doing, it casts a light into the under-researched ecology of three interdependent and recursive levels of learning. To do this, the discussion first reviews the study site's influential ideas and the potential affordances that expand Deepwater students' schoolyard action possibilities. Second, the chapter discusses three interrelated levels of learning that emerge from embedded case study children's self-chosen schoolyard affordance actualisations. For clarity these levels are each discussed separately as:

1. Primary affordances which influence the content of children's learning;
2. Secondary learning affordances that draw attention to continuities and discontinuities; and,
3. Tertiary learning affordances that expand conceptual awareness.

Grounds for Learning's discussion does not claim empirical validity however, rather it seeks to extend the literature by indicating plausible relations between experiences of environmental affordances and learning.

5.2 Potential affordances and influential ideas

Grounds for Learning aimed to explore relations between affordance actualisations and learning so referenced Heft's (1988) affordance typology. Learning was observed in each affordance category but it exhibited multifinality so this study's findings do not support a systematic correlation of affordance categories and learning. In general richer affordances were associated with greater diversity of activity and learning. One affordance category, loose parts, was central to the observed multi-level learning however, so it is discussed below. Cultural schemas also influenced, indeed liberated, learning-related behaviour and these are also briefly reviewed before the discussion proceeds to the core of this chapter; how children's self-chosen primary, secondary and tertiary affordance actualisation are related to learning.

5.2.1 Potential for formal learning

Although Deepwater's schoolyard was carefully provisioned and maintained it was not intended to be a Learnscape[57] that supported "a learning program" (ENSI undated, n.p.) and *GfL*'s descriptions of student affordance actualisations cannot be interpreted as showing that schoolyard activity alone produced formal learning. Observations of children actualising lever-related affordances give no indication of formal learning about levers, for example, and the absence of evidence for such learning is consistent with theory and research showing that formal learning is typically built upon cultural scaffolding (e.g. Fleer 2010, Vosniadou, Skopeliti & Ikospentaki 2005, Vygotsky 1934/1978, 2004). Today, for example, stories of Isaac Newton conceptualising gravity after reportedly observing an apple fall from a tree are known to

[57] The government of New South Wales and later the Organisation for Economic Co-operation and Development (OECD) Centre for Educational Research and Innovation, Environment School Initiatives program supported *Learnscapes* projects that linked school curricula and grounds.

underplay the importance of scaffolding[58]. As Glaveanu (2010, p.87) points out "any innovative idea or object never comes out *ex-nihilo*, as in the romantic visions of the genius" and learners stand, in effect, "on the shoulders of giants" (Southern 1952, p.203). Despite it not being designed as a site for formal learning this study found evidence that teachers and more expert others sometimes used Deepwater's schoolyard to scaffold curriculum-centred learning. Mouldable sand, for example, was used to teach sculpting in art, fractions in mathematics and investigation of material properties in science - all aspects of the formal school curriculum. These and other examples are not a focus for this study however, and readers whishing to explore instruction-scaffolded learning through activity are referred to the extensive existing literature[59].

5.2.2 Work-in-progress

GfL research shows that loose parts extended the repertoire of potential activities in each of Heft's (1988) affordance categories; they made water portable, surfaces enclosable and climbable features restful. But they did more than this, by making the actions and ideas of other children visible loose parts communicated meanings. Certainly cultural exchanges prepared children to read individual actions as meaningful but Deepwater's introduction of Work-in-progress prepared all children to interpret the meanings of actions and things; that Harry holding a metre long stick while running, for example, should be read as Harry flying.

Work-in-progress was introduced and maintained at Deepwater as a placeholder of loose parts but it afforded a secondary benefit - learning to more expertly perceive meanings. Different perspectives interpret the construction of this learning in a variety of ways but ecological perspectives suggest that the effect may be caused by students' perceiving Work-in-progress first as a structural, and then, as a transformational invariant[60]. From this perspective work-in-progress signs are structural invariants because they afford Deepwater students reliable information about the environment;

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[58] Popular culture has Newton discovering gravity but contemporary scholarship differs, see www.theguardian.com/science/2010/jan/18/issac-newton-apple-web

[59] E.g. Alozie, Moje & Krajcik 2009, Andrée & Lager-Nyqvist 2013, Elen & Clarebout 2001, Fleer 2010, Jablonka, Wagner & Walshaw 2013, Mehalik, Doppelt & Schuun 2008, Vosniadou, Skopeliti and Ikospentaki 2005, Walshaw 2013, Windschitl 2002, Wong, Chen & Jan 2012, Yoon, Elinich, Wang, Van Schooneveld & Anderson 2013.

[60] Piagetians would suggest that students who do not recognise that artefacts and places are constructed works-in-progress experience cognitive dissonance. The functions of cognitive dissonance are described extensively in the existing literature so are not elaborated in this study.

they communicate that something is more than a collation of loose parts, that someone had or is making an artefact. These same signs also function as "transformational invariants [that] allow perceptual systems to detect and track dynamic regularities" (Mossio & Taraborelli 2008, p.1328) because they signal a consistent relationship between artefacts and meaning-related activity[61]. Jacobs and Michaels (2007) describe a three-step process relating how structural invariants come to be perceived as transformational invariants. The process, with reference to work-in-progress, is:

1. *Drawing attention to the value of work-in-progress educates learner's intent.* At Deepwater early childhood teachers and peers introduce young children to the idea of work-in-progress as placeholder and a way to "extend the repertoire of children's activities" (FE, personal correspondence, May 5, 2014). Providing young children with work-in-progress signs help novices trial works-in-progress and increases opportunities for children to recognise the signs in use.

2. *Participating in works-in-progress educates children's attention.* Work-in-progress signs ensure that innovative affordance actualisations are sustained where they might otherwise be subsumed by normalising tendencies. The majority of children, such as Harrison and Freddie (section 4.2.3), use work-in-progress signs to protect meaning-related affordance actualisations and working-with-meaning becomes a dynamic regularity associated with works-in-progress.

3. *Actualising meaning-related affordances calibrates peer perception to the value of working-with-meaning.* Not all applications of work-in-progress signs are equally successful but innovative, meaning-related affordance actualisations garner peer attention[62]. That is, working-with-meaning becomes a high status activity for teachers and children. Perception is therefore calibrated to notice meaning-related affordance actualisations.

This three-step process indicates how Work-in-progress prioritises working-with-meaning and thereby expands the schoolyard's affordance potential to include the multi-level learning discussed in sections four and five of this chapter. First however, other

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[61] This view is consistent with Sewell's (1992) discussion of structuration theory's rules and resources as mutually constitutive and with Laurier's (2005, p.102) cultural artefacts (his example is car-parking spaces) as resources for and products of practices.

[62] Pellegrini (2009) notes that juveniles' innovative behaviour is known to attract attention in both human and primate groups.

influential learning affordances are briefly discussed.

5.2.3 Influential ideas: unhidden curriculum

GfL's literature review discerned that learning and all creative thought is part of a cultural tradition (Feldman 1974, p.68 cited in Glaveanu 2010, pp.87-88) and so the study is reminded that children's self-chosen schoolyard affordance actualisations are sometimes informed by opaque aspects of culture. Certainly this study's findings show that two key cultural schemas influenced (i) Deepwater schoolyard's physical ecology, (ii) children's affordance actualisations and (iii) schoolyard learning. Those schemas were Deepwater's concept of the 'environment as teacher' and its 'image of the child'.

Image of the child

Deepwater staff's reconceptualisation of children as "strong and capable" (Deepwater 2011, p.2) resonated with denominational beliefs about the relationality of childhood and Foucault (1994) on exercises of authority in education potentially contributing to the formation of individuals "in relation to others" (Mayo 2000, p.116). In essence however, Deepwater's "image of the child" (Rinaldi 2013, p.15) was inspired by a principle of Reggio Emilia education that posits an:

> "image of the child who, from the moment of birth, is so engaged in developing a relationship with the world, and intent on experiencing the world that he or she develops a complex system of abilities, learning strategies and ways of organising relationships" (Rinaldi 2013, p.15).

Grounds for Learning research shows that Deepwater expressed its image of the child in cultural schemas that liberated children's schoolyard affordance actualisations[63]. The school's reformulation of breaks in formal instruction as "outside learning times that inspire imagination" (Staff Meeting Minutes, October 23, 2007) promoted, for example, collective affordance actualisations such as building-with-sticks that are unusual in other schools. *GfL* research, as well as anecdotal reports from students, staff and parents, links adult perceptions of children as competent to enriched primary and secondary schoolyard affordance actualisations and ultimately to the tertiary affordances Ward (1961) discusses in relation to adventure playgrounds. That is, by

[63] Following the adventure playground movement, liberating activities is understood to animate children's internal propensities as a means to enhance the effectiveness of school policies. As such liberation is not an abrogation of responsibility. See Kozlovski (2008) for a discussion.

reconceptualising children as competent agents adults liberate what Ward (1961, p.201) described as:

> “a free society in miniature, with the same tensions and harmonies, the same diversity and spontaneity, the same unforced growth of co-operation and release of individual qualities and communal sense, which lie dormant in a society devoted to competition and acquisitiveness”.

Environment as teacher

Deepwater promoted a particular image of the child and study data shows that the schoolyard was also intended to teach this larger background, landscape or hidden curriculum of beliefs and values. Deepwater's *Environment as Teacher* publication states, for example, that the "environment embodies the beliefs and values of those who live and learn here" (Deepwater, May 25, 2011). Evidence suggests that Deepwater's schoolyard communicated its messages by prioritising certain modes of participation and by making that participation available for perception. For example, providing large tree rounds that groups of children could move (Image 71a) and allowing children to construct or grow private places for small group gatherings (Image 71b) prioritised collective activity and meaning making.

Images 71 a & b. The physical environment prioritises school goals. a) Moving a large tree round/chair requires collaboration (source; Deepwater, Term 2, Week 2, 2013). b) Four trees that children planted in an approximate square so that the place would suit small group gatherings and cubby building. Two years after planting, Araceli chose this as the place to build her first Deepwater cubby. The place continued to afford collective gatherings for at least three years after this research (source: Deepwater, Term 2, Week 6, 2013).

As a teacher Deepwater's schoolyard operationalized the school's image of the child and created an important point of distinction between the study site and more typical playgrounds that do not afford the range of possibilities conceptualised by Heft (1988). That is, environment was conceptualised as an educator that *encouraged* children to create and adapt those types of bio-diverse, "informal places" (Rasmussen 2004, p.155) which Hyndman, Benson and Telford (2014) and others acknowledge offer both rich “affordances for play and discovery” (Samborski 2010, p.100) and “important lessons on cooperation, ownership, belonging, respect and responsibility” (Malone & Tranter 2003b, p.289).

5.3 Primary learning affordances

During the research phase of this study Deepwater posted an online promotional video showing children choosing and actualising schoolyard affordances and, after viewing the video, the South Australian Project Officer with CSIRO’s Scientists and Mathematicians in Schools Program observed that:

> “If you look closely at your video you will find science of water, gravity, forces, levers, fulcrums, maths, construction/engineering, problem-solving and sound (percussion) being explored” (R. Anderson, personal communication, September 27, 2012).

Many of this study's observation are examples of exploration or looking closely at something but it is clear that, depending which perspectives are given priority, a variety of interpretations are possible. For example existing reviews (e.g. Ely & Pitman 2012, Martin 2011, Rickinson et al. 2004, Wachs 2000) typically suggest that environments influence learning either (i) indirectly, (ii) through the content they present or (iii) as locations where learning is practised. The following discussion takes a different direction and discusses how affordance actualisations influence implicit and social learning. First, *Contexts of learning* adds to the existing literature by discussing how materiality is related to learning and, significantly, to children associating meanings with artefacts and places. Subsequently *Contexts of sociality* explores the social implications of artefacts and places being read as having meaning. Later, in the second part of this chapter, *Secondary learning affordances* describes new territory in the field of environment - learning relations by elaborating how meaning-related affordance actualisations influence other levels of learning. Finally, *Tertiary learning affordances* relates examples of double binds that serve to enlarge children's awareness.

Images 72 a & b. Students explore schoolyard phenomena. a) Floating and sinking. b) Sound. (Source: Deepwater's promotional video)

5.3.1 Contexts of learning

Observation

Gibson's (1979) ecological psychology posits that affordances are perceived without needing cognitive formulation (Greeno 1994) and contemporary neuropsychology makes a similar claim, suggesting "plausible neurocognitive mechanisms that appear to subserve the 'picking up' of representational/cognitive 'content' *purely from the observation of overt conduct"* (Lizardo 2007, p.332, emphasis in the original). These perspectives therefore suggest that perceiving and learning are "a single process" (Jacobs & Michaels 2007, p.346) akin to becoming aware of information in and about the environment.

Grounds for Learning observed multiple instances where affordance actualisations "allow[ed] perceptual systems to parse structural components of the environment" (Mossio & Taraborelli 2008, p.1327). Deepwater's children picked up reliable information about the properties of a (nearly) horizontal plane by sitting-on, standing-on and placing-objects-on a large stone, for example (Image 73). Likewise:

> Edward picked up reliable information about the effect of gravity in an agent - environment system by repeatedly dropping a stick and observing its motion;
>
> Linus learnt about the properties of rocks and vegetation during repeated actualisations of affordances for crushing and grinding; and,
>
> Harry learnt that different physical contexts helped him regulate interactions with peers.

Image 73. Children perceive the standing-on, sitting-on and, in this instance, resting-loose-parts-on affordances of a large stone without the need for cognitive formulation (source: Deepwater, Term 3, Week 4, 2013).

Association

Behavioural views posit learning through association or "forming ... links between stimuli and responses" (Stetsenko & Arievitch 2002, p.86) and such learning can be described in cognitive terms as either "rehearsal[s] of old learning" (Ferholt 2007, p.50) or the acquisition of new information by assimilation[64] (Piaget 1952). Together behavioural and cognitive views adequately describe the primary learning observed in Deepwater's schoolyard. Linus, for example, rehearsed old learning when he recognised that three climbable structures were different heights and said: "I know", while repeatedly pointing to each of the structures and naming "high, medium and low" (November 18). Harry also rehearsed mathematical knowledge by insisting on one-to-one correspondence during wand making, classifying timber and sticks by size and type during packing/moving cubby-making resources and estimating length during campfire making. Other affordance actualisations that are also recognisably rehearsals of old learning include children spinning around vertical poles (Image 35a), bouncing balls and climbing onto structures.

In addition to rehearsals of old learning this study also found that affordance actualisations supported learning through by acquisition. Linus's interactions with a

[64] Note that Piagetian cognitive theory posits mental representations of learning whereas behavioural and ecological theopries do not. Precise descriptions of these differences are not deemed necessary for this study however.

Christmas beetle (*Anoplognathus* species) show, for example, that he noticed the beetle and, because he had no knowledge or prior experience of Christmas beetles, was afraid that it might hurt him. Observations then show that he observed the beetle from a safe distance (Image 74a). Next they show him becoming aware that the beetle crawled slowly and, a short time later, confirming his observation by manipulating the beetle with a pen (Image 74b). Having noticed and acquired information about the beetle's harmless behaviour, observations record that Linus categorised the beetle as an insect that may nip but not hurt.

Other examples of students perceiving and acquiring information during affordance actualisations in Deepwater's schoolyard include: Edward and peers gathering instrumental and procedural information while exploring the positions of objects and people on a variety of levers (Images 66 a - c); Marti experiencing a compacted gravel surface as unsuited to cubby making (Image 27b); and, young children learning which common leaves float and which sink through trial and error testing (Image 49b).

Images 74 a & b. Learning by perception and acquisition. a) Linus notices an adult Christmas beetle and initially maintains a cautious distance. b) After some moments observation Linus tests the beetle's abilities with a pen. Ultimately Linus observes that Christmas beetles are unlikely to harm humans.

Exchange

The processes of learning by observation and association discussed thus far are consistent with behavioural, ecological and neuropsychological perspectives in that none require learners to construct mental representations of actions or objects. Rather, recognition (Greeno 1994) or executing schemas that provide "structure to information" (Gallese & Lakoff 2005, p.469) are, thus far, sufficient to explain the mechanisms by which primary affordances support learning. Mental representations are nevertheless essential aspects of Vygotsky's (1934/1978, 2004) cultural - historical theory and Piaget's (1952) genetic epistemology around which an extensive literature relates social exchanges to learning. Consistent with these earlier studies *Grounds for Learning* observations also show object-related social exchanges affording learning. For example, a "bug garden" (May 30) that five year-old Roy built from plastic containers, stones and sticks initiated social exchanges that allowed Franklin to perceive a collation of loose parts as a meaning-filled artefact (Images 75 a & b).

Images 75 a & b. Built artefacts provoke social exchanges and acquisition of cultural knowledge. a) A novel arrangement of objects prompts Franklin to explore Roy's "bug garden" (May 30). b) Roy points to parts of the construction and describes what the artefact represents, where bugs will go and what they will do.

Initially the novel construction engaged Franklin's attention and he began exploring the artefact. Franklin was unable to guess or associate what the artefact was intended to do or represent however, so, in a position of uncertainty[65], he began carefully moving then replacing parts of the structure. Roy saw Franklin's explorations and, rather than risk the artefact being changed beyond recognition, explained that the rocks were beds. Then, as he placed the end of a stick in the swimming pool, he pointed out that it was a ramp and another stick was a ladder that would provide bugs with access to the rooms where they could dry out. During these explanations Franklin listened and shifted his gaze between Roy and the artefact then Roy provided further evidence for the accuracy of his assertion by pointing to an African black beetle (*Heteronychus arator*) crawling down a ramp. Franklin accepted Roy's interpretation of the artefact and continued his

[65] This uncertainty could be interpreted either as an example of Piaget's (1952) cognitive dissonance or Vygotsky's (1934/1978) zone of proximal development.

explorations while Roy absented himself. On returning, Roy discovered that the ramp had been moved again and, after replacing it, he again tried to help Franklin appreciate that artefacts have culturally defined meanings. (The effect of children accepting this proposition is discussed later as a secondary affordance of schoolyard activity). Roy and Franklin's exchanges show a clear consistency with Whalen (1995, p.326) who notes that a typical part of children's activities is to establish "a common definition ... by treating 'what something is' and 'where it goes' as fundamentally important matters for the activity at hand". Other self-chosen schoolyard activities show similar consistency. For example, exchanges between a box and eight year-olds who pretended to be a "box monster" (March 19, Image 76a) and nine year-olds who used river rocks to construct a boundary (Image 76b) each helped establish common definitions of what objects and spaces represented.

Images 76 a & b. Processes of social exchange ensure that artefacts become representations of configured meaning. a) After dialogue a cardboard box helps children represent a "monster" (March 19). b) Emerging from collective activity a line of river rocks symbolises, or represents, an agreed boundary (Deepwater, December 3, 2013).

Taken together the bug garden, box monster and rock boundary examples demonstrate that both physical affordances and processes of exchange help individuals recognise and negotiate what can and cannot be done with objects and spaces. These processes do not always expand affordance potentials and learning however. Observations also show that, when the meanings of affordance actualisations are poorly defined, wider social systems typically channel innovations toward mainstream practices. One such example is a story of Larry and Floyd, two five year-old boys, who jointly made a small clearing on a well-used pathway and defined it as a "prayer place" (February 14, Images 77 a - c).

Images 77 a - c. Processes of social exchange channel ill-defined meanings toward existing norms (February 14). a) Larry chooses a well-used path as a place to make an innovative artefact. b) Several passers-by notice Larry and learn that he is making a 'prayer place' but Floyd joins in. c) The completed meaning-filled artefact is barely distinguishable from its surroundings so will be destroyed by normal use of the path.

Processes of exchange (conversation and shared activity) helped Larry and Floyd to establish a common definition for their prayer place but other path-users were not included in the exchanges. Nor did the barely-visible artefact announce its presence and purpose to passers-by. Consequently, unaware of the artefact's existence, most children continued using the path in their accustomed manner and inadvertently transformed (destroyed) the artefact. Subsequently Larry and Floyd did not try remaking their prayer place on the path but found, instead, an out-of-the-way place for their constructions. Perhaps then, the processes of non-verbal exchange that destroyed the artefact may have helped Larry and Floyd achieve a more expert understanding of pathways.

On another occasion exchanges also ended Harry's efforts to define/construct a one-person refuge, in that instance turning his place-to-be-away-from-others into a place for sociality. In that instance peers joined Harry to help build a shelter and their involvement transformed his activity from that of creating a refuge into creation of a collectively defined place for shared activity. Once again, processes of exchange with social others channelled an innovation toward mainstream definitions. In a similar manner Lucy's exchanges with Linus, Lauren's exchanges with the "Four Amigos" (July 28) and Araceli's exchanges with Dakota also transformed definitions by expanding individual activities into collectively defined and animated shared affordance actualisations. The implications of such exchanges for sociality are discussed as secondary affordances below.

Summation

Consistent with existing literature this section shows that self-chosen schoolyard affordance actualisations support learning through processes of observation, association and exchange. As a result children learn about what can and cannot be done in the schoolyard - primary learning. Additionally, the section also shows that primary learning affordance actualisations add layers of meaning to affordance actualisations. Writing in *From Context to Contextualizing* van Oers (1998, p.482) suggests that such meanings are intended to characterise a "situation in terms of what could (or should) be done, and by the same token to exclude (for the time being) alternative interpretations." *Grounds for Learning* extends this insight by suggesting that configuring new meanings for artefacts, places and practices also affords a second level of learning. To develop this argument more fully the following section relates primary learning affordances and social competence. Subsequently, *Secondary learning affordances* elaborates artefacts, places and practices as media that mediate collective working with meaning.

5.3.2 Contexts of sociality

In common with other studies and reviews (e.g. Heerwagen & Orians 2002, Kernan 2010, Kellert 2012, Sobel 1993) observations at Deepwater school show that children learn to be socially competent when engaging with others in diverse and biologically rich contexts. Newton and Jenvey (2011, p.769) take "the view that it is the repeated opportunity for practice [rehearsals] of skills as opposed to play forms *per se,* which leads to increased social competence" and practising social skills was observed at Deepwater. Children also learnt social skills via association and exchange however. Five and six year-olds learnt how to listen and share by giving and receiving task-related feedback while sculpting sand with eleven and twelve year-olds, for example (Image 45, H. Darwin, personal communication, February 2, 2014). In this, *Grounds for Learning* departs from Newton and Jenvey (2011) and takes the view that actualisations of primary affordances support children's more expert participation in valued social practices. Here this study is consistent with Baines and Blatchford (2011) who indicate that shared schoolyard activities perform three functions in terms of peer relationships. They are:

1. "Scaffolding social interactions between children when they [children] are relatively new to each other" (Baines & Blatchford 2011, p.269);
2. Consolidating friendships and peer networks; and,
3. Providing opportunities to develop new social relationships.

Whilst Baines and Blatchford (2011) focus on social environments they concur ontologically with Wapner and Demick (1998) who identify two environmental contributions to sociality. First, Wapner and Demick (1998) suggest that physical anchor points consolidate social networks, a position that is consistent with, for example, observations that scented leaves, herbs and other loose parts became the locus of Araceli's and Dakota's rehearsals of social activity. Similarly, it is consistent with observations of physical elements supporting social rehearsals during Araceli's cubby making and Lauren's making miniature worlds. Also consistent are observations showing physical anchor points affording opportunities to try out skills during, for example, Harrison's block activities and Harry's re-enactments of stories from popular culture. Finally, schoolyard observations showing, for example, Freddie's ant adventure park garnering peer interest and collaboration or Edward's initial interest in collecting caterpillars attracting followers of varying ages, connect with the literature's "well-established finding that children … selectively explore novel stimuli" (Pellegrini 2009, Schulz & Bonawitz 2007, p.1045) to suggest that children may actualise innovative activities as affordances for social anchoring. These and other histories of affordance actualisations unmistakeably identify children as purposefully selecting and adapting schoolyard affordances both for social purposes and for the purpose of enhancing opportunities for sociality. Additionally, these observations are consistent with literature showing that children have "a strong sense of the environment as a social space" (Thomas & Thompson 2004, p.3). Therefore, whilst being careful to recall the possibilist nature of affordance actualisations, *Grounds for Learning* interprets these stories as supporting Malone and Tranter's (2003b**,** p.289) view that "a well designed play environment provides an opportunity to develop [not only practice] important lessons on cooperation, ownership, belonging, respect and responsibility".

Wapner and Demick's (1998) theorisation also suggests a second avenue by which schoolyard affordance actualisations might influence learning about sociality; that is, through experiences of self-world distancing. Lauren being excluded from cubby making can be interpreted as separating her from unhelpful contexts and "thereby permitting a creative [re]organization of the self'' (Wapner & Demick 1998, p.795), for example. Whilst self-world distancing is clearly applicable to social experiences such as Lauren's exclusion from cubby making and Harry's flight from Deepwater's sports field to a place of refuge near his homeroom, observations also show that physical elements facilitated more subtle re-organisations of the self. For example, Linus's cubby effectively distanced him from the schoolyard milieu[66] and mediated social exchanges with a small group of peers by providing a degree of privacy and an assortment of non-prescriptive objects that encouraged collective activities. The observation that Linus's peer group survived less than a day after relocation into the broader schoolyard highlights that cubbies afforded separation and perhaps, for some children, self-world distancing. Similarly, the privacy afforded by Deepwater's ephemeral creek can be positioned as affording separation that allowed Lauren to configure Four Amigos relations. *GfL* did not specifically investigate self-world distancing but Araceli's preference for "quiet and friendly" (July 28) cubbies with "not many people around" (September 14) is suggestive of self-world distancing. The observations also align with Wachs and Gruen's (1982) findings in regard to stimulus shelters and Kaplan (2001b) and Herzog, Maguire and Nebel (2003) who purpose being-away and compatibility as significant variables in Attention Restoration Theory. The possibility that children may have become aware of self-world distancing as an influence on, or a means to, configure sociality suggests however, that meta-awareness could itself be a product of affordance actualisations and this is discussed as a secondary affordance shortly.

Summation

Grounds for Learning findings show that Deepwater's schoolyard functioned as a place to: rehearse skills that scaffolded social interactions and consolidated friendships; and, associate and exchange information about *what* to do in terms of social participation - both of which are primary affordances. Continuities in primary affordance actualisations may also be the basis for meta-awareness, or learning *how* to participate in physical and social environments, a possibility that is discussed shortly as a secondary learning affordance.

5.3.3 Synopsis

Deepwater's schoolyard was not a neutral context, its enriched differentiated landscape and behavioural freedom afforded activities that were atypical of schoolyards (L. Burman, personal communication, February 2, 2014) and which supported learning by rehearsal, observation, association and exchange. Through these processes children learnt *what* they and others could and could not (yet) do in the schoolyard. Sometimes

[66] Tyrer's (2002) formulation of nest therapy as a psychological intervention for the management of adult personality disorders acts in a strikingly similar fashion. In extreme cases where therapy is unlikely to resolve personality disorders Tyrer proposes adjusting a person's context so that it is a more appropriate fit for the individual.

this learning included content described in the Australian Curriculum; children noticed flowers in their environment, used them to make perfume or jewellery and identified and justified the thinking behind choices they made (ACARA 2013, p.714), for example. The popularity of schoolyard affordance actualisations, such as transforming flowers into perfume and shrubs into cubbies, arose from a variety of sources including awareness of the value given to those activities by significant adults but, more than this, children chose imaginative affordance actualisations because they were fun, a good fit for the context and because they increased the likelihood of peer engagement. The skills, knowledge and attention that children rehearsed, exchanged and acquired in these activities were, then, the primary learning affordances of schoolyard activity.

Contexts of sociality suggests that two currents influence schoolyard affordance actualisations, (i) meaning-related innovations that garner peer attention and (ii) existing social definitions that tend to displace innovation. In the next part of this chapter *Secondary learning affordances* elaborates how turbulence in the ebb and flow of children's schoolyard affordance actualisations prioritises negotiations of meaning and produces what Jung (1966, p.178) describes as:

> "a consciousness which is ... a function of relationship to the world of objects, bringing the individual into absolute, binding, and indissoluble communion with the world at large."

Having discussed how Deepwater's schoolyard promotes the consciousness to which Jung refers the second part of this chapter then accounts for the learning that was observed through an elaboration of what Harlow (1949, p.51) calls "learning to learn".

5.4 Secondary learning affordances

> *"If we see only what is formed, the same, we come to think it must be so ... but if we see the anomalies, misformations, gigantic deformities, then we recognize that the rule is indeed firm and eternal but is at the same time alive, that creatures do not grow from the rule but can within it transform themselves"* (Goethe 1830/1985 cited in Dent-Read & Zukow-Goldring 1997, pp. 14-15).

> *"the products of human action, whether of a symbolic or material nature, function as second order mediators. ... objects that are the products of labour, of actions directed outwards at and on the world, are the external or objective expressions of understanding ... which order and structure not only our actions but also the awareness and consciousness"* (Miller 2003, p.16).

5.4.1 Introduction

At first glance Goethe's and Miller's insights seem contradictory; Goethe, on the one hand, writes "that creatures do not grow from the rule" and, on the other, Miller states that objects order and structure actions, awareness and consciousness. First readings can be deceptive however, and the fuller texts show there is unity too. Both writers contemplate agents who transform themselves; Goethe from within the rule and Miller by labour that makes understanding manifest and so available to the intersubjectivity of others. Previously *Primary learning affordances* showed that Deepwater's schoolyard is a collation of diverse places and spaces where rehearsals and processes of observation, association and exchange support learning. Now however, *Secondary learning affordances* joins Goethe and Miller to discuss how, through the medium of primary learning affordances actualisations, children become aware that their activities can configure sociality. Subsequently the processes by which participating in affordance actualisations communicates higher-level information or knowledge about practice are described. In essence *Secondary learning affordances* argues that children learn to recognise working-with-meaning as a functionally significant aspect of their schoolyard activities and that the recognition affords entrée to other levels of knowing and participation. The section ends with the suggestion that children's expanded awareness of context is indicative of their learning to learn.

5.4.2 Deepwater's schoolyard: the medium is the message [67]

Deepwater's cultural schemas and enriched physical environments powerfully influenced *what* children perceived and did in their schoolyard. They also influenced *how* children participated in schoolyard activities. Linus's story is a case in point; for ten months Linus dug earth, manipulated loose parts and crushed rocks/vegetation but gave little attention to how his affordance actualisations influenced sociality. Then during a period of shared construction "King Linus" (November 7) discovered that younger children would sometimes listen to and follow his advice. Linus's advice on how to adapt the cubby was simple but, because it introduced ideas and practices that were new to younger children, they willingly explored them. And so, Linus experienced affordance actualisations as a tool that configured sociality. Importantly, while he was

[67] The medium is the message is attributed to populists McLuhan & Fiore (1967) who suggest that print and electronic media have a "particular capacity to extend personal perception and ultimately to shape social organization" (Ferguson 1991, p.76). The phrase is adapted here to indicate that Deepwater's schoolyard affordances reconfigured contexts for sociality.

king, Linus tried being "a polite boss" (November 17), an orientation that mediated awareness of how others perceived advice and activity. Later, when Linus's cubby was taken over and he had returned to crushing rocks and vegetation, he used the activity to attract and sustain the attention of other younger children. That is, because Linus had perceived that affordance actualisations may configure sociality he did not need to learn how crushing-with-rocks could attract and maintain social attention because being king had mediated learning about the influence of novel activities - a secondary affordance. His learning was not unusual either, Harrison had shown a similar dawning of meta-awareness when he actualised activities with blocks as a means to re-define himself as an inventor as had Gordon who used a self-made climbable feature to coordinate and synchronise social exchanges with other children. These and other stories relate histories of participants engaging freely in enjoyable, meaning-related primary affordance actualisations as a way to configure contexts for sociality - a secondary affordance. Importantly, in the context of Deepwater's schoolyard, the non-prescriptive character of resources that helped presence sociality also required collectively defining actions and artefacts lest, as for Larry and Floyd, the artefacts and practices be destroyed. This suggests that at least part of the schoolyard's hidden curriculum communicated how to participate in social contexts.

Part of this study included reviews of data by independent experts. After reviewing a collation of video excerpts Paul Clarke, Visiting Professor of Education and Research at St Mary's University, London commented that:

> "our sense of being within a place, our capability to see, touch, taste, hear and smell the reality of our environment and truly be within that space - that is real learning. To learn, through experience, to love that which holds us together is to learn to be a fully rounded human being, that is what the film asks us to consider" (P. Clarke, personal communication, February 26, 2014).

"That which holds us together" can be interpreted as an observation that children were learning to love, or know, their physical and social environments; an interpretation that is consistent with this study's stories of student schoolyard affordance actualisations. Araceli, for example, did more than rehearse, assimilate or exchange skills, knowledge and concepts during cubby and perfume making. In an informal interview a few weeks after she started at Deepwater Araceli related, for example, that imagining, negotiating and doing things together during cubby making was a way she made friends. Araceli explained that:

> "you get to meet new people and you get to bond in new friendships ... because ... you sort of forget about everything else ... and focus on what you're playing" (February 24).

During the February 24 interview Araceli highlighted the pivotal role of shared activity with objects and later, after social conditions displaced her from the cubby and she had tried unsuccessfully to define a role for herself by hanging around on the school's climbing structures, she experienced the truth of this observation. Later in the year Araceli's actualised affordances to synchronise and coordinate intent and activity with Dakota and, following that experience, she described the schoolyard as an environment for creating places where she felt "really happy ... and safe" (September 14). Similarly, shared activity and meaning making was a basis on which the "Four Amigos" (July 28) constructed a free society in miniature. In other words Linus, Araceli, Lauren and others learnt that primary affordance actualisations could re-configure their microsystem in ways that they valued.

Summation

Deepwater's schoolyard: the medium is the message shows that students used shared, meaning-centred and often innovative primary affordance actualisations to configure sociality - a secondary affordance. Learning how to configure sociality was not always a process of exchange however, indeed some social exchanges tended to channel innovations towards established patterns of relationship. Instead, learning what activities consistently attracted and sustained peer attention was, for students like Linus, a product of experiencing *and* noticing the differences that innovative primary affordance actualisations made in social contexts. That is, experience tuned his perception to the social continuities of meaning-related activities. In the next section *GfL* explores how perceptual tuning that affords children more expert participation in social environments also influences how students engage with spaces, places and artefacts.

5.4.3 Learning: a hidden curriculum

Existing reviews (Blackmore et al. 2011, Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment 2004, Martin 2011, Rickinson et al. 2004, Wachs 2000) surmise that environmental elements and processes influence learning and development but the means by which this occurs remain under-researched. *Learning: a hidden curriculum* explores this blind spot in the literature. It first builds on Robbins's (2007) proposal that awareness of an activity's meaning is an affordance. As with secondary affordances for sociality, the discussion shows how perceptions of meaning become a functionally significant aspect of schoolyard activity. The section then extends the existing environmental literature by showing that meaning-related learning affordances mediate more expert knowing and doing.

To strengthen its explanation of how self-chosen affordance actualisations are related to secondary learning this section follows Bennett and Elman (2006) and Roberts (1996, p.66) to "minutely trace sequences within and across cases so that the events being explained become microscopic". In doing so the discussion returns to consider how actualisations of a primary learning affordances lead to working-with-meaning.

Consider the example of large tree round (Image 78) which theory (Gibson 1979) and anecdotal evidence indicate children perceive as affording standing-on, sitting-on and resting-loose-parts-on.

Image 78. The horizontal surface of a large (approx. 1m x 0.4m) tree round affords standing-on, sitting-on and resting-loose-parts-on. Note: children have left pine chip softfall "money" resting-on the "shop table" (June 12).

The properties associated with standing-on, sitting-on and resting-loose-parts-on afford learning what can and cannot be done with the tree rounds and other stable horizontal surfaces. In addition they sometimes afford other primary learning; crushing plants on stable surfaces provides reliable information about the mechanical strength of vegetation, for example.

Histories of primary learning affordance actualisations also imbue collations of objects and practices with identities, or other levels of meaning, that turn spaces into the sorts of places discussed by Relph (1976). Observations show, for example, that sometimes imaginative primary affordance actualisations transform tree rounds into lookouts, walls and even kitchen settings. Image 79 illustrates children's transformation of one tree round as more than just a space for collecting objects. The inclusion of a work-in-progress sign in this collation and the care with which mulberry leaves were placed on the sign's edge suggest an intent to create and retain a place *for* pretend cooking. Similar observations demonstrate that the horizontal surfaces of Deepwater's tree rounds were, at other times, transformed from spaces of possibility into places *for* sitting, standing, leaping and crushing.

Image 79. Children used this tree round as if it were a kitchen table. The work-in-progress sign indicates that the users wanted other children to interpret the collection of objects as a meaning-filled collation.

The places children created through primary affordance actualisations were not fixed however, and their definitions remained fluid. Thus, although actualisations of primary learning affordances were "active response[s] to the concrete context[s]" (Fleer & Peers 2012, p.418), they also generated and sustained expanded ecologies of meaning. Imagine, for example, how children might encounter the collation of artefacts shown in Image 80. Experts might immediately recognise the example as a domestic tableau and, if so, their responses could be rehearsals of old learning (e.g. pretending to drink from the mug), variations on an existing theme or an innovation. Novices, however, will either carry on as if the tableau was a random assemblage of unrelated objects or else recognise that the objects were collated. Then, if novices want to engage with an artefact/place's expanded ecology, they must wonder what the artefact/place is *for*. That is, when novices recognise and engage with a work-in-progress they move through actualising what-can-be-done and into engaging with how-to-work-with-meaning. And this may be the beginning of a significant transformation.

Image 80. Araceli actualised primary learning affordances to transform these tree rounds into a recognisable domestic tableau and thus she integrated the tree rounds into an expanded ecology of meaning. (Note: no work-in-progress sign[68].)

Sometimes, as with Roy and Franklin or Larry and Floyd, social exchanges (which are not a focus for this study) were the processes by which novices moved through primary and into secondary learning affordances. Other examples, described previously as actualisations of potential affordances are cases in point. Harrison and Freddie, for example, actualised loose parts to try on an identity and the activity mediated learning. From this social constructivist perspective, and paraphrasing Miller (2003, p.10), Freddie's activities actualised learning not as "a steady accretion of knowledge about a task, [but instead as] a shift in one's basic understanding of what the objects and events in a setting are." In other instances the materiality configured by earlier primary learning affordance actualisations also mediates learning. For example, four logs (Image 81) that a child had arranged as a form of cubby were immediately recognisable as an artefact and afforded (or *mediated*) working-with-the-meaning-of-enclosure.

[68] Relatively few older children actualised work-in-progress signs. An implication may be that experience had given them a sound basis to assume that their peers and younger children would recognise works-in-progress without needing a sign.

Image 81. For experts an approximately rectangular arrangement of logs is immediately recognisable as an enclosure. Novices who encounter the collation, on the other hand, must either ignore meaning or work with the artefact as though it had meaning.

This study observed many instances where materiality afforded recognition of and working with cultural meanings. For example, previously discussed examples relate Deepwater children specifically choosing and arranging materials so that they were easily recognisable as guitars, magic wands or broomsticks. In these and other instances recognising objects and spaces as constructed artefacts or places prioritised certain sorts of responses - working with cultural meanings - and thus they became tools that afford secondary learning. Wells (1999, p.320 after Wartofsky 1979) explains this is because:

> "material and symbolic [forms are] ... embodiments of the knowing that was involved in their production ... [and can], in appropriate circumstances, make that knowing available to others."[69]

One story however, shows that moving through primary learning affordances and into the second-level learning that Bateson (1972) imagines does not rely solely on meanings or learning being embedded in cultural artefacts. Instead, it relates how Edward's early interest in caterpillars moves *from* observation *through* actualisations of affordances for caterpillar farming and *into* a recognition of caterpillar - host plant dependence. The story then relates Edward recognising the continuity of caterpillar - host plant dependence across affordance actualisations and this awareness then affording his working with the meaning of habitat. And here the central role of

[69] This, of course, accounts for learning as a environmentally afforded phenomenon but does not suggest a positivist view of learning-environment relations. Sewell (1992) discusses similar processes in relation to transformation.

affordance actualisations is highlighted; Edward's understanding of habitat was not, as Bortoft (1998, p. 284) states when discussing Goethe's work:

> "encountered by stepping back to take an overview, for it is not over and above the parts, as if it were some superior, all-encompassing entity. The whole [was] encountered by stepping right into its parts."

To use Bortoft's metaphor Edward encountered the meaning of habitat by stepping into a flow of affordance actualisation that focussed his attention on contextual information (primary learning about caterpillars and host plants). Then, through repeated actualisations, Edward achieved that state of timeless flow to which Csikszentmihalyi (1975) refers; he was able to perceive, within the life-cycle dependence of caterpillars on their host plants, what ecological psychologists Mossio and Taraborelli (2008, p.1328) call a "dynamic regularity". Subsequently mediation (or, as Vygotsky might suggest, acting with the plant as with the concept) then provides the means for Edward to give attention to the concept (of habitat) and his words "saving a species" (April 4) demonstrate his working with this new meaning. In short, affordance actualisations mediated a higher-level concept. The implications of inhabiting a landscape that communicates meanings are shortly discussed as tertiary learning affordances.

Summation

Learning: a hidden curriculum interprets secondary learning affordance actualisations as processes that draw attention to the "contexts of the contextual information" (Bateson 1972, p.255). One example, that of children recognising tree rounds as domestic tableaux, shows how learners can become aware that artefacts and places prioritise working with cultural meanings and a second example shows that perceiving the continuity of species - food dependence afforded construction of a new higher-level meaning. Both are examples of, in Harlow's (1949, p.51) words, students "learning to learn" and both support more expert participation in culturally valued practices.

5.4.4 Synopsis

Shields (1990, p. 39) writes that the liminal landscape of Brighton in England "comprises an imaginary geography filled with both myths and realities, which transforms the empirical datum of land into a phantasmagorical landscape of affects." So too, histories of individual and collective affordance actualisations imbue

Deepwater's schoolyard artefacts, places and practices with meanings that are "construct[s] of the imagination projected onto wood and water and rock" (Schama 1995, p.61).

Through processes of observation, association and exchange students learn what can and cannot be done in Deepwater's schoolyard. However, actualising primary learning affordances also changes the learning context by adding layers of meaning to artefacts and places. *Secondary learning affordances* shows that primary processes calibrate children's perceptions to the effect of imaginative affordance actualisations with the result that children come to recognise the functional significance of working-with-meaning. For Linus, like so many of his peers, learning what innovative affordance actualisations meant in terms of sociality became a way to configure sociality and for Edward, prompted by recognition of Monarch caterpillar dependence on swan plants, working with meaning mediated, or afforded, a higher-level concept - habitat. In these and other stories working-with-meaning draws learners' attention to the larger ecology of schoolyard activities and so affords an equifinality of learning to learn. Such learning is not an end-point however; potentially it becomes the ground on which another level of consciousness can be constructed - the ground of tertiary learning.

5.5 Tertiary Learning Affordances

"Ever-newer waters flow on those who step into the same rivers"
(Heraclitus 535 BC - 475 BC).

5.5.1 Introduction

Primary learning affordances engage participants with what can and cannot be done in context and secondary learning affordances prioritise working-with-meaning as the how of continuing participation (Zittoun & Cerchia 2013) in material, social and conceptual environments. Recognitions of continuity are at the heart of secondary learning but sometimes discordant, and apparently irreconcilable, messages or double binds (Bateson 1972) intrude on continuity and, in so doing, afford opportunities for tertiary learning that Engeström (2001, p.138) describes as "radically questioning ... [and reconstructing double binds in] ... wider alternative context[s]" and which Aitken (1992, p.557) identifies by "significant and noticeable departures from previous patterns". The following section briefly discusses observations that Deepwater's schoolyard drew attention to double binds and afforded both breaking and expansion of established continuities. It then reconnects schoolyard affordance actualisations with contemporary theory to suggest that Deepwater's alignment of ideas, practices, resources and actors affords tertiary learning.

5.5.2 Double binds

Deepwater's embrace of imagination and relationship created a schoolyard where learning-about-contexts and learning-how-to-participate-in-ongoing-place-making were intrinsic to the flow of children's self-chosen affordance actualisations. Occasionally however, schoolyard continuities were disrupted and double binds emerged.

Once during *GfL*'s observation phase a group of children recognised changed adult expectations as incompatible with their experiences of schoolyard continuity and that social context became an opportunity for tertiary learning. In 2008, for example, Deepwater teachers and students began co-developing and using part of the schoolyard as a place for, amongst other things, running and chasing (see chapters 4.2.2-Practices, 4.2.2-Outcomes & 4.3.1-Mulch). During 2009 and 2010 co-development and use of the schoolyard Woodland Meadow continued but, in March 2011, an injury caused by an un-related accident prompted school staff to ban running and chasing games in that part of the schoolyard where both had previously been encouraged. This prohibition afforded students three learning possibilities[70]. First, if an "individual felt that they had little control over the events in their life and so responded passively" (Camacho et al. 2013, p.1233) they would be afforded learned helplessness (Hiroto & Seligman 1975) - a primary learning affordance. Second, if individuals or groups (e.g. newly enrolled children) were not aware that prohibition was at variance with the school's previous policy but sought to have the injunction repealed, their actions would generalise to awareness of school protocols for listening and responding to students - a secondary learning affordance. Last, students who had helped develop the area *for* running and chasing and whose experience up to that point gave reason for their feeling that they were trustworthy, responsible agents capable of co-developing new activity settings would encounter a double bind. That is, unilaterally prohibiting a preferred activity because adults deemed it unsafe presented an image of students as vulnerable individuals who were unqualified to make wise choices about their own activities - a message that was at odds with the continuity of students' previous experiences. Given

[70] The possibility that students were either not aware of conflicting messages or did not care about changed rules are both conditions for no learning.

their history as liberated co-constructors it is unsurprising to note that such students naturally attempted to resolve the free-constrained double bind by renegotiating the context. They were unsuccessful however, and discovered that, even with the support of their peers and after six months of using agreed consultative processes, they lacked the authority to make or change school rules. That power was invested with the school principal. In this instance students learnt, through the double bind of liberating schoolyard affordance actualisations and constraining social structures, that their earlier conceptualisation of the schoolyard as a place of freedom, trust and self-efficacy occurred in the context of a larger hierarchical system. In other words these students were afforded tertiary learning.

In the above example changing social conditions were the source of a double bind, the resolution of which showed some students that a fixed hierarchical system governed their choices. Quite regularly, however, popular schoolyard activities such as cubby making, flower harvesting and bug farming depleted the very resources that were being actualised and this produced a category of double binds that (i) originated in microsystem materiality and (ii) afford expansive tertiary learning. The seasonally popular practice of caterpillar farming, for example, seriously depleted the food source on which the caterpillars depended and thus threatened the survival of swan plants, caterpillars and caterpillar farming. For Edward, whose caterpillar farming had helped him perceive caterpillar-swan plant dependence, recognising the threat produced a double bind comparable to that described in Hardin's (1968) influential *Tragedy of the Commons*. In Hardin's scenario herdsmen who graze cattle on common pastures recognise that over-exploitation threatens the resource but they continue overgrazing in order to maximise their share of the diminishing resource. A herdsman then experiences a double bind because, whilst reducing pressure on resources is generally acknowledged as advantageous, no individual acts for fear of being secretly condemned as a simpleton who could be shamed into standing aside while others continued their exploitation (Hardin 1968). *Grounds for Learning* observations show that Edward experienced a similar double bind. On the one hand he recognised that continuing to harvest swan plants and caterpillars was not a responsible use of the resource and, on the other, he saw the futility of an individual ceasing harvesting. In this example, Edward's moving beyond the conserve-exploit double bind to "save a species" (April 4) by attempting to grow swan plants in a more protected area afforded his reframing the concept of habitat (secondary learning) within a larger conceptualisation of human-species-habitat relations. In short, schoolyard activity afforded Edward what Engeström (2007) refers to as an invisible breakthrough that is indicative of tertiary learning.

5.5.3 Integrating medium and meaning

Hardin (1968) identifies double binds as inevitable consequences of unfettered resource use so, by the same logic, Edward's experience of a double bind can be recognised as a predictable outcome of Deepwater's liberation of agency, imaginative affordance actualisations and meaning-making. This study suggests that the schoolyard does more than provoke double binds however, it suggests that emplaced traces of learning that are "externalized time and again through practical actions, words and symbols" (Engeström 1990 p.189) afford other levels of "possibles" (Rinaldi 2001, p. 150) including learning how to resolve double binds. In short, Deepwater schoolyard's hidden curriculum presupposes the possibility of tertiary learning. Two study findings support this interpretation:

First, Deepwater's reification of Welcome, Respect and Construct as it's mantra meant that school newsletters, assemblies and a steady stream of visitors highlighted the value given to constructive outdoor learning. Additionally those schoolyard works-in-progress that endured became identifiers that helped children recognise artefacts and places as made by social others like themselves. Together these top down and bottom up messages ensured that children read artefacts and places as evidence that their ideas and activities *should* influence the form and actualisation of physical contexts. For example, four trees (*Allocasurina verticillata*) were consistently read by Araceli and at least ten other groups as a place *for* imaginative activities including creating climbable structures (Image 82a) and making cubbies (Image 82b).

Second, as suggested by Rinaldi (2001, cited in OECD 2004, p.15), reading the landscape afforded primary, secondary and tertiary "knowledge building event[s]". For example: Larry and Floyd learnt *what* to do on paths; Lauren learnt *how* attending to context could be a means to configure sociality; and, Edward learnt that agency, imaginative affordance actualisations and meaning making both produce double binds and afford a model for their resolution. In this latter case the schoolyard system functioned as a model for expanding awareness and participation because, paraphrasing Capra (2005, p. xiii), basic principles of schoolyard continuity (agency, imaginative affordance actualisations and meaning making) were read as principles for expanding participation in the schoolyard system (resolving the double bind).

Taken together this study's findings suggest that Deepwater schoolyard's agency, imaginative affordance actualisations and meaning-making provoked and supported, or afforded, the radical questioning of contradictions within an existing microsystem and their reconstruction in a wider system. That is, this study's findings indicate that Deepwater's schoolyard afforded tertiary learning.

Images 82 a & b. Reading the landscape. Children consistently read an arrangement of four trees as affording agency, imaginative activities and meaning making. (Sources: Deepwater Nov 7, 2013 and August 15, 2013).

5.5.4 Synopsis

Tertiary learning affordances begins by discussing how Deepwater schoolyard's diversity of resources, liberation of agency and reification of meaning making encouraged a constant flow of ever-newer affordance actualisations. Subsequently *Double binds* shows that the flow of Deepwater affordance actualisations created tensions between familiar, established meanings and the perceived meanings of emerging physical and social phenomena - tensions that sometimes produced double binds. *Integrating medium and meaning* then discussed how the dynamic regularities of schoolyard agency, imaginative affordance actualisations and working-with-meaning helped students expand their participation in enlarged schoolyard systems. Histories of Deepwater's schoolyard affordance actualisations are thus shown to afford tertiary learning.

5.6 Synthesis

Just as flowing water differentiates rivers from lakes so too Deepwater's naturalised schoolyard is defined by constant flows of agency, imaginative affordance actualisations and renegotiations of meaning. Stepping into flows of primary, secondary and tertiary affordance actualisations thus immerses learners - children and researchers alike - in histories of meaning-making that afford ever-newer learning about what it means to be an agent, a researcher and a learner.

Deepwater schoolyard's primary learning affordances are animated by three well-known processes: observation; association; and, exchanges of learning through which, either alone or in combination, individuals learn what they, others and materiality can and cannot (yet) do in their context. Often implicit, this learning sometimes coincides with content described in the Australian Curriculum but more often it relates to a multifinality of children's specific interests and purposes. And multifinality[71] perhaps explains why contemporary reviews name the influence of environments on children's learning and development whilst largely ignoring the processes. Here, however, *Grounds for Learning* research offers new insights; Linus, for example, learnt *what* to do when crushing-with-rocks and, in the flow of affordance actualisations, also expanded his learning into *how* to configure sociality. Similarly, Lauren and many other children transformed primary learning affordance actualisations into the *how* of co-constructing social and, significantly, conceptual contexts. Edward, for example, encountered the continuity of caterpillar - host plant dependence then formulated his concept of habitat. In other words, through learning to attend to the context of contexts (Bateson 1972) he was learning to learn - a secondary learning affordance.

On the surface secondary learning affordance actualisations are characterised by both continuity and equifinality but the flows run deeper and, in fact, may sometimes encounter contradictions. When they do, histories show that children can reconcile the contradictions by expanding awareness of themselves in context. Edward, Linus, Lauren and Araceli for example, expanded perceptions of dependent relationships *into* contexts of relational participation with social and physical ecologies.

Grounds for Learning shows how these histories of primary, secondary and tertiary learning affordance actualisations emerge from Deepwater schoolyard's purposeful alignment and liberation of agents, resources and cultural schemas and thus the research suggests that self-chosen schoolyard affordance actualisations can constitute an ecology *for* and *of* multiple levels of learning.

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[71] With hindsight perhaps the researcher might have given greater initial consideration to the observation by Rogoff et al. (1998, p.691) that "the search for interactions between separately defined person and situation factors yields infinite interactions."

6 Conclusion

> *"the role of learning is to enable learners to develop their ability to make sound choices in the face of the inherent complexity and uncertainty ... and so acquire, as Sen (1999, p.74) puts it: 'the substantive freedoms – the capabilities – to choose a life [they have] reason to value' "* (Scott & Gough 2009, p.94).

6.1. Introduction

Grounds for Learning research explores how a schoolyard influences primary-school students' learning and findings indicate that activities in a material environment help children to learn (i) what they can do, (ii) how they can learn and (iii) where their activities intersect with larger systems and concepts. In other words, children begin to develop the capability to choose lives they have reason to value. These findings add shape and detail to theories and philosophies of learning at least as old as Plato's advice that educators should "avoid compulsion, and let ... children's lessons take the form of play" (Plato 1945, p.536). However, more than two millennia after Plato drafted *The Republic*, indications are that education's commitment to self-directed learning remains "weak, or at least problematic, in practice" (Fleer 2010, p.67). Schools' mandated break times could provide children with the time and space for self-directed learning but schoolyards typically "operate by inciting kinetic modes of pleasure" (Kozlovski 2008, p.172) so limit opportunities for learning. Nevertheless, the contemporary literature supports an hypothesis that environments may influence learning in three ways: by being a source of stimulation; through the content they present; and, as locations where learning is practised (Wachs 2000). Little research examines relations between learning and children's activities with the artefacts, places and spaces that constitute schools' outdoor learning environments. However, Grounds for Learning research addresses this gap, and, by enhancing understandings of how children learn in schoolyards, improves school and system capacities to develop school grounds as contemporary educational resources. In doing so the research also addresses "one of the central questions of human geography ... the relationship between people and place" (Holloway & Hubbard 2014, p.37).

Ongoing neuropsychological research suggests that materiality may contribute to higher-level cognitive processes (Lakoff 2012) but existing studies do little to expand on how perception, broadly defined as flows of sensory input (Gibson 1992), influences higher-levels of schoolyard learning. *Grounds for Learning* research proposes an elaboration of J.J and E. J. Gibson's (1979, 1992) ecological psychology and uses its research as a plausibility probe to test how perception may inform other levels of learning. Thus, a key contribution of this study is its synthesis of three existing perspectives: ecological psychology which discusses how experience calibrates perception (Jacobs & Michaels 2007); neo-Vygotskian perspectives that posit mediation as the means by which cultural artefacts become psychological tools (Miller 2011); and, Bateson's (1972) framework which proposes that continuity and double binds are provocations for multi-level learning.

In *Auguries of Innocence* William Blake (1803, n.p.) suggests the seemingly impossible; that humans might "Hold Infinity in the palm of your hand". This chapter has the considerably smaller, though still somewhat challenging ambition, of presenting the outcomes of *Grounds for Learning's* theorising and research in a succinct discussion. For clarity the chapter is structured to bring together earlier discussions then juxtapose them with key issues from theory and practice. Study limitations are also reviewed, potential future research is suggested and a conclusion is drawn. Finally, in demonstrating the plausibility of its synthesis, *GfL* answers the question, "how are primary-school students' self-chosen schoolyard affordance actualisations related to learning?"

6.2 Literature review

Views on how people learn are as old as philosophy but the once dominant nature - nurture dichotomy no longer holds sway. Since Immanuel Kant (1781/1855, p.212) posited that all learning "begins with sense, proceeds thence to understanding, and ends with reason", Western thinking has granted that humans construct what they know. For an historically brief moment constructivist and post-structural scholars argued that all one could know are mental constructs but contemporary perspectives posit that knowing and learning emerge from the interplay of fluid, multi-scale systems (Bronfenbrenner & Morris 2006). Studying macro-micro connections has historically been problematic but this is not an impediment to *GfL* which accepts that what matters for learning (and research) "is the environment as it is perceived" (Bronfenbrenner 1979, p.4); the perceived environment then, is the focus of *GfL's* research.

6.3. Design of inquiry

Grounds for Learning animates a phenomenological-systems approach to research by situating year-long histories of five primary school children's self-chosen schoolyard affordance actualisations within the wider cultural and spatial environment of a school that configures schoolyard resources, practices and schemas as educative tools. With systems perspectives in mind, this study's justification for selecting Deepwater as an influential case prepares the ground for subsequent analysis and description of the schoolyard's potential affordances. Then, a synthesis of video observations and children's accounts form the basis for interpretive narratives that give privileged insights into learners' experiences. Last, process tracing within and across narratives reveals patterns in children's affordance actualisations that consistently relate to three levels of learning.

6.4 Findings

6.4.1 Potential affordances

This study had hoped to identify systematic relationships between Heft's (1988) affordance categories and children's schoolyard learning but within and cross-case comparisons showed no consistent associations between affordance categories and learning. With hindsight it is clear that this eventuality is anticipated in both Heft's (1988) conceptualisation of categories as having multiple potential affordances and the multifinality von Bertalanffy (1968) associates with open systems. Though disappointing, this study's findings nevertheless support the usefulness of conceptualising environments in terms of functional relations.

Although *GfL* results do not identify consistent affordance category - learning relations, cross-case comparisons of narrative histories do reveal regularities that relate affordance actualisations and learning at three levels. Given that the histories account for children who have different value priorities and different experiences of schoolyard affordance actualisations, the consistency of results discussed in the previous chapter and summarised below (section 6.4.4) adds veracity to this study's finding that a schoolyard microsystem can stimulate and support both every day and higher-level learning. The congruence of *GfL* findings with other research (e.g. Czałczyńska-Podolska 2014, Kernan 2010, Kyttä 2003) including Kaplan, Kaplan and Ryan (1998) who discuss human experience in terms of spatial arrangements and particular items of interest also suggests a degree of external validity for *GfL's* findings.

6.4.2 Personal characteristics

The well-known 'butterfly effect' (Bishop 2009) analogy makes clear that small differences in one system may have wider influences; remaking a cubby in a new place is likely to precipitate changes in activities and peer-relations, for example. So too, different personal characteristics are posited to affect children's learning (Bronfenbrenner & Morris 2006). Although discernment and description of personal characteristics is usually the work of psychologists and novelists, *GfL* chose to increase the probability of finding consistent microsystem effects on learning by selecting study participants whose value priorities showed maximum variation. In this regard the strategy was successful although both this study's focus on material influences and the small sample size mitigate against suggesting implications for values theory. Nevertheless, this study notes that Linus's self-chosen schoolyard affordance actualisations changed from (i) ends-focussed activity (primary affordance actualisations) to (ii) actualising primary affordances for secondary social benefits and this, the study suggests, is indicative of a shift in value priorities. *GfL* is unable to relate the precise mechanisms of value priority change because some of Linus's affordance actualisations took place in a secluded cubby where university ethics committee requirements meant that voice and video recording were intermittent. Then again, the known interdependence of value priorities and experiences suggests that cubby-related affordance actualisations are likely to be involved and, fortunately, other examples from this study are able to show how perception becomes tuned to salient microsystem affordances.

6.4.3 Primary affordances for learning

At the level of primary affordance actualisations, *GfL*'s results show that students learn by both observing and associating everyday information about schoolyard elements and through processes of social exchange. For example, children closely observe the behaviours of unfamiliar creatures and associate the perceived behaviours with possibilities for their own learning and action. Similarly, social exchanges draw attention to what established practices mean in terms of affordance actualisations. For example, children exchange understandings of what it means to share when peers disagree on resource use. Consistent with established theory and research *GfL* finds that these processes educate or "canalize" (Gottlieb 1991, p.6) awareness toward shared conceptualisations of schoolyard artefacts, places, spaces and practices. Thus, children learn what they and others can and cannot do in the schoolyard or, in other words, primary affordance actualisations inform the content of children's learning.

6.4.4 Influential ideas

Grounds for Learning research discerns and describes the potential affordances that are available in Deepwater's schoolyard and results show that the enriched, naturalised space enlarges the repertoire of children's activities. Additionally, research findings show that two less obvious factors have a significant influence on the schoolyard affordances that children actualise. They are (i) the authority given to children to experiment with schoolyard affordances and (ii) school staffs' Piagetian approach to supporting, and where possible not interfering with, children's affordance actualisations. Both of these factors are part of the school's explicit strategy to nurture competent, inquiring and relational children; strategies that have their origins in post-war reactions to the excesses of totalitarianism (Kozlovski 2008) and contemporary expressions of what has become known as the Reggio Emilia philosophy of education (Malaguzzi 1998, p.57). Thus, for each of the participants in this study, schoolyard materiality *and* cultural schemas together, afforded a holding environment in which they first perceived, then experienced - and sometimes configured - social relations.

6.4.5 Secondary learning affordances

Answers to *GfL*'s question regarding what affordances study participants actualise also show how activities in Deepwater's schoolyard, or holding environment, influence sociality and second-level learning. First, children learn what they can do alone, with schoolyard resources and with social others. Of particular significance here is children learning that their teachers expect them to create artefacts, places and spaces and that, when they are creative, their enactments will be protected and celebrated. This expectation is made clear and material by teachers introducing and enforcing work-in - progress as a placeholder that preserves ongoing material constructions. Second, children perceive that significant adults and peers value creative works-in-progress. This occurs through teacher-led sharing and reflection but also incidentally as peers encounter one another's works-in-progress. Third, children experience positive feedback when they actualise affordances for novel, or non-functional, meaning-related purposes. For example, Linus's history relates the case of a newly enrolled student who has no previous experience of work-in-progress and shows that he learns, through observation, association and exchange, that novel and creative actualisations attract and sustain peer attention. That is, Linus becomes aware of a consistency in the ever-changing flow of schoolyard affordance actualisations. Linus's perception of continuity through different schoolyard affordance actualisations enhances his participation in culturally valued practices so, for *GfL*, education of perception is, following Booker's (2010) definition, identifiable as learning.

Research findings also indicate that, for other children, educating perception animates processes that mediate new levels of learning. That is, children who become aware that schoolyard conditions are configured by other agents' ideas and practices, begin looking for the knowledge embedded in microsystem artefacts, places and spaces. In some instances, that knowledge is available for direct perception and mediates learning. When, for example, children perceive: four sticks arranged as an enclosure; or, a drawing of an intended construction, they suspend their agency and, like actors delivering an author's lines, perceive artefacts and places from another's experience and conceptualisation (Miller 2003). Thus, through perception, children learn to attend to the continuity of meaning-related affordance actualisations that characterises the schoolyard microsystem; an affordance that Harlow (1949, p.52) calls "learning to learn".

6.4.6 Tertiary learning affordances

Grounds for Learning's examination of affordance actualisations that help children learn to learn also uncovered instances where established modes of participation in schoolyard activities (knowledge) were contradicted by higher-level elements. Histories of secondary affordance actualisations reveal two instances where resolving double binds expanded children's awareness beyond previous perceptions of the extant microsystem. Specifically, the two examples show that, what learners perceived as continuities in meaning-related affordance actualisations, contradicted: first, changes in adult expectations of what a place would be used for; and, second, student over-use of a primary affordance.

In the first instance emplaced histories of meaning conflicted with messages that adults were presenting and children learnt through social exchanges that, contrary to their earlier impressions, school rules were not negotiated constructs; in fact they were manifestations of the principal's authority.

In the second case, Edward, aged eight, perceived that enactments of schoolyard agency, which allowed students to actualise primary affordances, also permitted the depletion of a valued resource to the extent that it was in danger of being exhausted. Here, no social exchange was required because Edward perceived that the pattern of affordance actualisations was unsustainable. Thus, his perceptions presented conflicting information that he could not resolve in the microsystem as he then understood it; how, after all, could a resource be so valued and yet also depleted to near exhaustion? Edward had also learned through long experience of schoolyard activity that he could, and indeed should, actualise artefacts, places and spaces to configure new relationships. And that is what he did. Edward actualised the agency, imaginative activity and meaning making afforded by the enriched and liberating schoolyard to preserve the resource. In the process he both expanded his understanding of the microsystem and made his new conceptualisation of the system material. In short, perceptions of continuity, a double bind, and freedom afforded tertiary learning.

No moment of learning is an island however, and Edward's resolution of a double bind was mediated by his history as a learner-agent who configured systems. Experience of primary and secondary affordance actualisations afforded Edward's learning to learn and, when Edward's system of knowing was challenged by contradictions, it was the image of himself as an agent that afforded his resolution of the double bind. History had not taught him *what* to do "save a species" (April 4) but he had learned that *how* to re-make system meanings through imaginative affordance actualisations. When faced with a double bind this learning mediated perception and enabled him to choose *where* he participated in the enlarged system. With this generalisation *GfL* approaches an answer to the key research question; how are Deepwater children's self-chosen schoolyard affordance actualisations related to learning? Consistent with Gibson (1992), Vygotsky (1934/1978, 2004) and Bateson (1972) the research indicates that experience of self-chosen schoolyard affordance actualisations:

1. Enables perception of *what* individuals and others may do during primary affordance actualisations;
2. Educates perception of affordance-related consistencies - a secondary affordance from which children learn *how* to participate in valued schoolyard activities;
3. Calibrates awareness of meaning-related secondary affordances so that personal freedom and a capacity to configure artefacts, places and practices are perceived as dynamic regularities of schoolyard affordances;
4. Makes contradictions between current understandings of the schoolyard microsystem and higher-level factors perceptible;

5. Permits resolutions of contradictory micro-mesosystem messages through participation in the larger systems that constitute the schoolyard; and,
6. Opens the possibility that learners may choose *where* their participation influences larger systems.

6.5 Theoretical implications

Grounds for Learning's close, insider-examination of embedded cases ads shape and detail to the processes by which children's activities support learning. The study is consistent with contemporary systems perspectives in that it highlights the interconnectedness of learning, social, spatial and conceptual dimensions. With its focus on how children's learning is influenced by spatially and temporally bounded experiences in an educational setting, the study findings will be of interest to those whose work encompasses children's geographies, educational research and landscape/urban design.

In addition to the interpretations of children's spatially related activities, the study offers two theoretically relevant insights in relation to affordances and constructions of learning.

6.5.1 Systems views

Whilst disappointing in one sense, *GfL*'s finding that multifinality is a characteristic of primary learning affordance actualisations is, nevertheless, consistent with Heft's (1988) conceptualisation, possibilist constructions of human-environment relations and Bronfenbrenner and Morris's (2006) discussion of the Bioecological Model of Human Development. The study's observed equifinality of higher-level learning should not be taken as contradictory of the above or suggesting some form of determinism however, since case histories clearly show that Deepwater's cultural schemas, social practices, participants' constructed meanings and histories of schoolyard affordance actualisations are implicated in convergences of learning. Taken together this study's findings of both multifinality and equifinality are supportive of contemporary systems perspectives.

6.5.2 Affordances

Wartofsky's (1979) primary, secondary and tertiary terminology is useful for *GfL*'s discussion of multi-level learning affordances but the concept of other-level affordances is in need of theoretical refinement. Whilst the logic of affordances is clear and flows directly from J. J. Gibson's (1979) definition of them as action possibilities that emerge from an organism's relationship with its perceptual environment this study's review found that only Robbins's (2007) conceptualises meaning as an affordance. Further exploration of affordances as a multi-level construct may therefore prove useful for other researchers.

In regards to Kyttä's (2003) addition of 'affordances for sociality' to Heft's (1988) typology *GfL*'s observations show many examples of affordances for sociality emerging from Heft's (1988) existing categories - shelters afford social gathering and sharing others' business for example. Additionally, this study found no examples of sensory inputs affording sociality that could not be accounted for in the existing categories. It is, therefore, this study's contention that sociality may be better conceived as a secondary affordance; the author is not an ecological psychologist however, so leaves development or rejection of such theoretical implications to those who are most qualified.

6.5.3 Environmental influences on learning

In the literature environmental influences on learning outcomes are variously described in terms of attention (e.g. Bagot, Allen & Kuo 2008), stress (e.g. Chawla et al. 2014), stimulation (e.g. Lieberman & Hoody 1998, 2000 & 2005), social contact (e.g. Faber Taylor, Wiley, Kuo & Sullivan 1998), motor skills (e.g. Fjørtoft 2004) and health (e.g. Hillman, Erickson & Kramer 2008). Existing studies, however, do not discuss how environments, or actions with environmental artefacts, places and spaces are related to learning processes.

J.J. and E.J. Gibson's (1979, 1992), Vygotsky's (1934/1979, 2004) and Bateson's (1972) perspectives are prominent in their respective fields but this study's synthesis of their work has not previously been to applied to theorisation or research on children's experiences of schoolyard learning. Study findings provide some evidence that *GfL*'s hypothesised synthesis of perception, mediation and expansion does describe learning processes. *GfL*'s synthesis is further supported by the congruence of tertiary learning and Stetsenko's (2009) neo-Vygotskian view that:

> "people come to know themselves and their world ... in and through (not in addition to) the processes of collaboratively transforming their world in view of their goals and purposes" (Stetsenko 2009, p.139).

The study also notes that contemporary neuropsychological research has begun exploring the possibility that human sensory motor systems can perceive concepts embedded in the environment (e.g. Gallese & Lakoff 2005, Lakoff 2012) and that, should the technology become portable, these inquiries may provide more robust linkages between activity with artefacts and multi-level learning.

6.6 Policy implications

GfL recognises that hypotheses and descriptions of contingent relations may be of less use to policymakers than expositions of pattern, so the following section offers an interpretation of how patterns in *GfL* findings might inform policy and practice. In doing so the study joins a long-standing education reform movement that suggests reconceptualising educator and learner relationships with space (Huse 1995) and Reggio Emilia educators who propose conceptualising the environment as an educator (Rinaldi 2013).

6.6.1 Schoolyard resources

Grounds for Learning's findings demonstrate that enhancing and regulating schoolyard resources so that children are able to reconfigure materials, meanings and practices transforms schoolyard spaces into learning environments. It is known that designing schoolyards without considering educative purposes constrains their usefulness (Cosco & Moore 1999, n.p.) so a functional approach that considers how schoolyards advance educational objectives is recommended. For example, loose parts contribute to educational objectives in at least three ways. Loose parts: (i) are valued by children so influence perceptions of how students are regarded by educators (Titman 1994); (ii) are capable of transforming what and how children learn in their schoolyard; and, (iii) can be configured by children to crystallise meaning and thus potentially mediate higher-level learning. In affording these benefits loose parts therefore serve the fundamental educative purpose Carr and Claxton (2002) outline:

> "The fundamental purpose of education for the 21st century, it is argued, is not so much the transmission of particular bodies of knowledge, skill and understanding as facilitating the development of the capacity and the confidence to engage in lifelong learning" (Carr & Claxton 2002, p.9).

Small changes in topography that have disproportional effects on children's activities might also address the same objectives. For example, this study found that when shallow depressions serve as shelters individuals and small-groups occupy them for extended periods and that the occupants actualise experimentation and sharing-of-interests. In the same way conjunctions of water, mouldable materials and loose parts promote collective attention and cross-age sharing that can support feelings of belonging and mastery.

Given that this study confirms relations between children's self-directed actualisations of schoolyard affordances and learning outcomes that are a good fit for 21st Century education, *GfL* suggests that schools and educational systems review policies and practices that guide the development, resourcing and use of schoolyards to ensure that, as at Deepwater, their policies and practices also express contemporary educational objectives. In this regard, using affordance categories as lenses could usefully extend playground models that currently prioritise gross motor movement (e.g. see Kozlovski 2008) and help enhance contexts where elimination of diversity has been a tendency (e.g. Evans & Pellegrini 1997, Jarrett & Waite-Stupiansky 2009, Zigler & Bishop-Josef 2009).

6.6.2 Conceptual models

In Australia early childhood services are now required to provide children with access to naturalised outdoor environments and government policies promote the benefits of nature-based activities. Consequently some schools and centres have developed, or are in the process of installing, naturalised spaces. *GfL* results support this trend but suggest, as do Malone and Tranter (2003b), that redesigning and reprovisioning schoolyards is an insufficient response to evidence linking experience of nature and children's wellbeing. If naturalised schoolyards are to become effective educational resources, changes are also required in practitioner and educator epistemological assumptions regarding space and risk (Moore 2006).

Environment as teacher

Reggio Emilia educators refer to the environment as an educator (Rinaldi 2013, p.28) and *GfL* borrows the analogy to suggest that the space can be three types of educator; viz: (i) a teacher of content, of what can and cannot happen; (ii) a teacher of process, of how to participate successfully; and, (iii) perhaps least understood of all, an enabling teacher. To become all three types of teacher, the environment must not only be responsive to its students but, at the third level, the environment must show that it is responsive. At this third level a responsive schoolyard embeds traces of children's meaning making in its material forms and makes them available for ongoing learning.

To paraphrase Professor Carla Rinaldi, President of Reggio Children, responsive processes make:

> "thinking ... material, that is, tangible and capable of being interpreted ... [so that when] ... it is offered to the interpretive subjectivity of others ... [it can] ... be known or re-known, created and recreated ... as a collective knowledge-building event" (Rinaldi 2001, cited in OECD 2004, p.15).

If educative schoolyards are to facilitate the type of learning that Carr and Claxton (2002) identify as fundamental to 21st century learning, *GfL* suggests that educators and practitioners must reconceptualise themselves and school environments as responsive elements in children's processes of meaning making.

Risk

Deepwater's conceptualisation of risk is not unique but does contrast with other more typical schools that have an "excessive concern for certain types of safety" (Wyver et al. 2010, p.263) and consequentially, as Wyver et al. (2012b p.95) demonstrate, prohibit activities that children might value. Deepwater's approach is also in line with convincing evidence which demonstrates that managing, rather than eliminating, risk is beneficial (e.g. Ball 2002, Mitchell, Cavanagh & Eager 2006) and with the UK's peak health and safety body, the Health and Safety Executive (2012), which now promotes the view that:

> "Play is great for children's well-being and development. When planning and providing play opportunities, the goal is not to eliminate risk, but to weigh up the risks and benefits. No child will learn about risk if they are wrapped in cotton wool" (Health and Safety Executive 2012, p.1).

Ten years ago the Australian standard for playground equipment stated "the objective of this Standard is to minimize risk of injury to children using playgrounds" (Standards Australia 2004, p.5) but the revised standard is less risk-averse and includes an introduction stating that risk-taking:

> "is an essential feature of play provision and of all environments in which children legitimately spend time playing. Play provision aims to offer children the chance to encounter acceptable risks as part of a stimulating, challenging and controlled learning environment" (Standards Australia 2014, p.6).

Given that liberated schoolyard affordance actualisations are shown to stimulate and support multi-level learning, this study suggests that school and education systems consider developing and promoting statements similar to the Health and Safety Executive's (2012) *Children's Play and Leisure - Promoting a Balanced Approach* as a means to stimulate dialogue and action in relation to the risks and benefits of schoolyard activities.

6.6.3 Schoolyard design

In its review of the literature this study encountered guidelines, recommendations and design textbooks that developers, managers and workers who are seeking schoolyard design inspiration find useful (e.g. see: Department for Education and Skills 2006, Herrington, Lesmeister, Nicholls & Stefiuk 2007, Keeler 2008, Parsons 2011, Shackell et al. 2008). Many of these texts reflect Jones's (2000, p.33-34) view that "variety ... is now seen as critical for children's ability to be able to construct their own worlds in ways which are satisfying to them". *GfL*'s findings indicate that variety is an essential element in schoolyard learning but they also suggest that structure has a key function. For example, the common practice of linking various elements across space for "uninterrupted flow[s] of play" (Queensland Government n.d., p.12) reduces the possibility that children will find or create the secluded places that promote sociality and extended engagement with innovative activities whilst boundaries within larger spaces enhance the potential for place making. Boundaries need not be fences however, mounds or planting of sufficient height and depth also provide the sense of being away that many children favour. Given that higher-level learning occurs in places that offer children some control over the activities that take place there, *GfL* recommends that designers consider both flows and boundaries within spaces as essential design elements. This recommendation is offered with some hesitation however, and should be considered in light of the limitations outlined below.

6.7 Limitations of the study

Grounds for Learning results associate liberated, self-chosen affordance actualisations in an enriched schoolyard with processes of perception and mediation that generate multiple levels of learning. This is a novel finding but it does need to be tempered by consideration of three clear limitations of the study.

First, any study which finds that experiences influence learning must expect that individuals who experience different environments may learn differently. Therefore, although maximum variation sampling establishes the plausibility of *GfL*'s synthesis in one context, transferring the results to other contexts requires caution.

Second, this study sought to identify relations between environmental elements and learning but found, instead, that affordance categories are characterised by a multifinality of learning outcomes. In common with other studies of human-environment relations *GfL* extends its interpretation to processes and, in so doing, relates student perceptions of continuity and discontinuity to higher levels of learning. As such the study proposes that schoolyard learning may be less about "the skills that happen to be part of … [affordance actualisations and more about] the wilful belief in one's own capacity for a future" (Sutton Smith 1995, p.290). In this, *Grounds for Learning* connects with the aims of 21st century education which are "much more about ways of thinking ... [and] ways of working ... as an active and engaged citizen" (OECD 2010, n.p.) than learning particular content. Thus, this study's results do not describe schoolyard elements or affordance categories that provoke specific interests, activities or learning outcomes.

Third, *GfL* had hoped that its research would provide design guidance for schoolyard reformers but this was only partially successful. Certainly, study results indicate that enhancing schoolyard diversity and freedom expands the repertoire of children's activities and learning. Children's ability to configure, sustain and renegotiate the meanings of artefacts and places was also pivotal for higher-level learning therefore, if adults are contemplating remaking schoolyard spaces, designs ought to respect the site's existing meanings, activities and resources. Just as it is common for landscape designers to work within the physical constraints of any site, so too histories of children's meaning-related affordance actualisations must be respected otherwise the designer risks (i) unknowingly impoverishing places, (ii) diminishing the possibility that children will perceive themselves as legitimate creators of meaning and (iii) promoting learned helplessness. For these reasons this study's ambition to identify design principles for schoolyards no longer contemplates arrangements of physical elements; instead *GfL* draws attention to process principles. One of these is the earlier suggestion that schoolyard design should relate to educational goals, now however, a second principle looks in the opposite direction. That is, *GfL* results indicate that designers, practitioners and educators should consider how schoolyard designs, resourcing and regulation animate children's already-existing primary, secondary and tertiary affordances. In this the study follows Bakos, Bozic and Chapin's (1987) now nearly three decades old recommendation to suggest that:

> "A good deal of material ... seems to be published ... with the idea that [designers] (and administrators, amongst others) will make better [places] by using the results of [research]. This presents an interesting dilemma. Using the results of studies suggests avoiding having to go directly through the process of study and particularly ... the process of immersion. Surely there are many facts to be learned [from researchers] ... more important than their facts though is their processes of interacting directly with users over time. In this sense and to a limited degree ... [research] has the potential for imposing itself between [designers] and what they ought to experience directly" (Bakos, Bozic & Chapin 1987, p.288).

A limitation of *GfL* research may, therefore, be that it might also separate designers, practitioners and educators from appropriate dialogues with the children and spaces they aim to serve.

6.8 Recommendations for future research

GfL's synthesis of learning by perception, through mediation and into expansion was tested using a small-number maximum variation sample in an Australian cultural context. Hofstede (2001) suggests that Australians tend to be strongly individualistic so the possibility exists that individualism may influence the affordances children actualise and/or their learning through mediation. Given that research shows mediation is effective in other more collectivist contexts (Cole 2005b) the latter is unlikely but future research may elaborate these possibilities.

GfL's study site is characterised by its 'natural' elements but this study did not seek or find evidence suggesting that natural, as opposed to made, elements influence children's learning processes. It may be that 'nature' did not appear to be significant for children at this study's site because it was pervasive. There is, however, a body of literature that indicates relations between green environments and learning are possible. Groves & McNish (2011) report that UK children's indoor learning is influenced by greening spaces, for example, and Bagot, Allen & Kuo (2008) associate green schoolyards with improved attention and academic performance. Despite this study's lack of findings relating affordance categories to specific learning processes, *GfL* notes

Trageton's (2007b) observation that mouldable materials afford particular cognitive processes and this presents a potentially interesting avenue of inquiry. For example, a project combining both *GfL*'s synthesis of learning processes with controlled introductions of natural elements (or perhaps a specific affordance category e.g. mouldable materials) may discern patterns of material influences on specific learning processes. Contemporary Australian studies (e.g. Engelen et al. 2013) indicate that introducing loose parts affects levels of children's physical activity so future research may also identify relations between loose parts or other affordance types and learning processes. Researchers contemplating such a task should note, however, that the Learnscapes interventions of more than a decade ago did not produce evidence of reliable links between environmental qualities and specific learning outcomes (Skamp & Bergmann 2001).

In 1988 Heft proposed a functional approach to landscape description that has since proven useful for a number of studies. Given the expansion of research in children's geographies and related fields, it may be opportune to apply Heft's (1988) method to reviewing the increased number of studies that are now available to confirm or refine the existing classification of affordances. Such research may also develop or test the theoretical and practical applicability of affordances as multi-level construct.

A strength of this study is the insider perspective that was made possible by the researcher's long-term membership of Deepwater's learning community. Necessary university ethics requirements that aim to protect children may in themselves generate conditions that influence participant behaviour. For example, it was normal practice for Deepwater staff to photograph and video students during outside learning times but maintaining the required identifiable researcher identity and practice produced a situation where two girls behaved atypically during one period of outside learning time (see section 3.4.5 *Ethical issues and perspectives*). Future research may therefore usefully explore the methodologies and ethics of child studies to inform appropriate safeguards that do not un-necessarily limit the possibilities for achieving emic perspectives, genuinely responsive research or the participation of children as researchers.

6.9 Conclusion

Grounds for Learning's theorising and research indicates that children's self-chosen schoolyard affordance actualisations influence processes of learning:

a) By affording what children perceive, associate and socially exchange in regards to artefacts, places and spaces;
b) Through mediating awareness of how children can engage with culturally valued and materially constituted microsystem continuities;
c) When emergent, discordant meanings draw attention to where larger systems intersect with personal experiences; and,
d) Because reconfiguring system elements can crystallise higher-level concepts and participation.

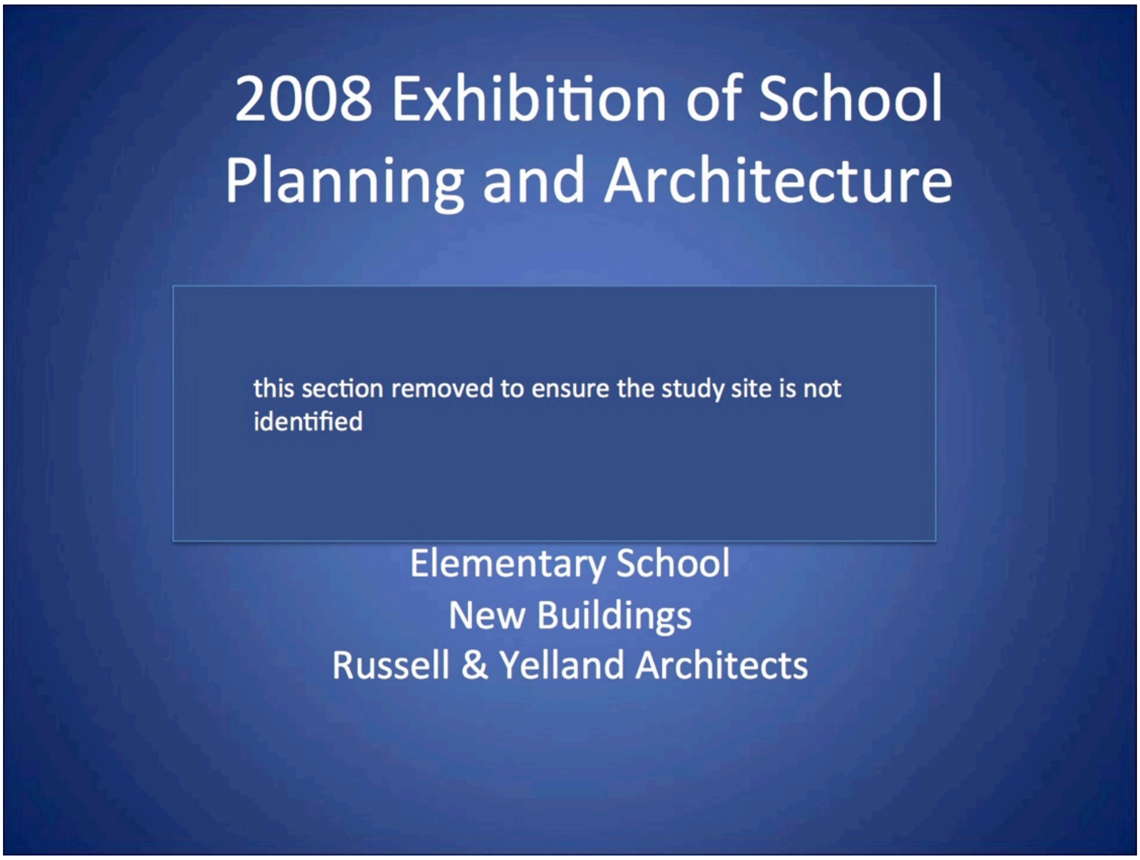
In coming to these conclusions this study sheds light on the processes by which a schoolyard influences children's learning and so affords researchers, policy makers, and practitioners a way to reconceptualise outdoor learning environments. These findings also bring the study full circle; to a realisation that, if schoolyards are to be truly effective learning environments, they must provoke and support the types of ongoing inquiries and place making that is imagined for 21st century education. That is, learning environments will support all learners (students, teachers and researchers) to approach every experience with the intent that T. S. Eliot (1942/1969, p.67) describes in *Little Gidding*:

We shall not cease our exploration
and the end of all our exploring
will be to arrive where we started
and know the place for the first time.

Appendix A

Council of Educational Facilities Planners International (CEFPI) (2008) Exhibition of school planning and architecture.

Online version of the nomination that formed the basis for CEFPI awarding Project of Distinction



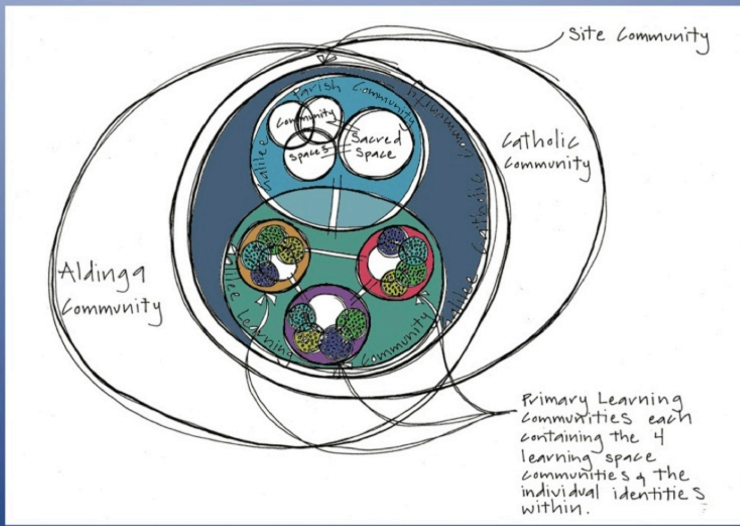
Community Within Community

Community Environment:
narrative

During extensive consultation, the briefing community reiterated that the "school" is not to be thought of as a disconnected building. Rather, it is a learning environment inextricably linked to its surrounding environment.

Initial talks touched on the idea of not needing a school building and instead using a range of spaces throughout the townscape allowing children to become a real part of the everyday social environment. While fantastic in theory the physical and economic practicalities of needing home base for student groups was too great. The decision therefore was to bring the community into the site and link it into the school.

The school is therefore just one part of a larger encompassing site community focused on life long learning in a faith based environment. The site will eventually include a church and multipurpose spaces, community health and counseling facilities, opportunity shops, a preschool, community sports fields, fitness/walking tracks and community reflection and play gardens.



Shared Learning Space:
for school & extended community

Community Environment:
Continued

Connection with the community is already strong, with a clear focus on bringing the parents in to be part of the children's learning, linking the school with the local preschool and church (which currently uses the main gathering space for weekend Mass while the church is being designed and built) and links with such groups and institutions as Flinders University and the nearby Eco Village (sustainable residential development).

The overall vision was clear: to create an integrated community of faith, learning, family and friendships. The dream was for this community to be a place of service and life long learning to all families. It was also clear that the learning component would need to fit as a part of the total vision.

Outside Learning Space: variety & flexibility

Learning Environment: *narrative*

Defining 'the learner' gave the community group a foundation for its initial deliberations. The group moved forward with two overarching understandings; that learners are competent, active, social and critical beings constantly producing change through dynamic movement with the environment, systems and with each other and that a learner's competencies and motivation can be enhanced or inhibited by the setting.

The strong relationship between space and pedagogy became the focus of debates amongst the members of the Education and Building Group. And although some argued that a good teacher can use any space for good teaching and learning, all members of the group felt cautious in underestimating the power of space as a teacher itself.

Members were influenced by understandings where the environment is unequivocally seen as a third teacher and physical space is a language of its own with a strong conditioning factor communicating culture and values.

Inside learning space, Home area 1: promoting calm, encouraging discovery

Learning Environment: *Continued*

Flexibility in the design of the physical space would help teachers and learners explore more fully pedagogy that gives greater life to the notion of holistic education and would encourage the evolution of theories.

Breaking open the notion of holistic learning led to an exploration of the challenges inherent in the use of one defined space as the learning classroom. The built environments would need to support a vision for learning that encourages connectedness, making meaning and truly exploring different ways of learning. Underpinning the vision were beliefs about building social and emotional well being and capacity, learning how to learn, sustainability and the provision of spiritually rich environments within an integrated Arts and Science focus.

Providing for learning inside and outside, in gardens and orchards, at the beach and in the scrub, and in small and large spaces would require an innovative approach as well as ubiquitous technology. Every aspect of this building would need to be a metaphor for the broader vision of community within community to meet the needs of young people today and into the future.

Framing the environment:
Indoor & outdoor display

Physical Environment: *Narrative*

The school sits within an existing barley crop with wide open views of a nearby hill range, so creating large open beautiful vistas of the surroundings was an easy task. The difficulty was more in reducing and fine tuning the views to highlight, engage and encourage reflection and discovery. This was achieved through a range of differing window sizes and shapes (both internal and external), framing certain windows with bands of color and warm timber and encouraging reflection through seating placement. The smaller windows, some 200 x 200mm in size, all set at different heights encourage peep hole viewing, encouraging children to view and focus on small sections of the environment. This could be the ground to focus on sprouting seedlings or the movement of insects, the sky to focus on weather patterns and colors or the nearby indoor learning space to watch the activity of feet moving around the room to help understand social activity.

Environment as teacher:
early growth orchard

Physical Environment: *Continued*

The school's landscaping is made up of a range of spaces, set up to reflect the surrounding environment. This includes a sand dune mound to reflect and teach about the nearby beach and beach landscape and almond orchard to reflect the motions of surrounding agriculture practices. Each internal space overlooks and opens out to these external spaces, enlarging each classroom space and enhancing the flexibility of the school and its spaces and opportunities of learning about the local environment.

These vistas reinforce the social environment of the learning community by provoking discussion, sharing ideas, exploring, discovering and creating, within the overt context of the physical environment.

Cave connections:
home area 1 stage & display

Planning Process: *Continued*

Combined with the four interconnected L shaped classrooms and a range of external environments, the building comprises a multitude of spaces for an abundant range of activities. Children are free, and encouraged, to roam in and between these spaces, internally and externally to make full use of all learning opportunities.

Overall we can say the building is a cave, a welcoming sheltered place compared to its wide open windy surroundings. We can say the central gathering space is the watering hole and each surrounding class is a cozy cave. But really each space is made up each of these spaces, created through differing ceiling heights, raised floors, differing window sizes and heights and the L shaped classroom which quickly allow easy division within the spaces. The most apparent cave-like spaces are the bay window/stage areas situated in the central gathering space and in each classroom. Each is colored in a soft relaxing blue or green and situated to highlight views of the hills to the south or entry to the west, they provide wonderful little spaces to read, to relax, to sit and chat, reflect on surroundings and share stories.

Indoor outdoor connection:
home area 2

Planning Process: *Narrative*

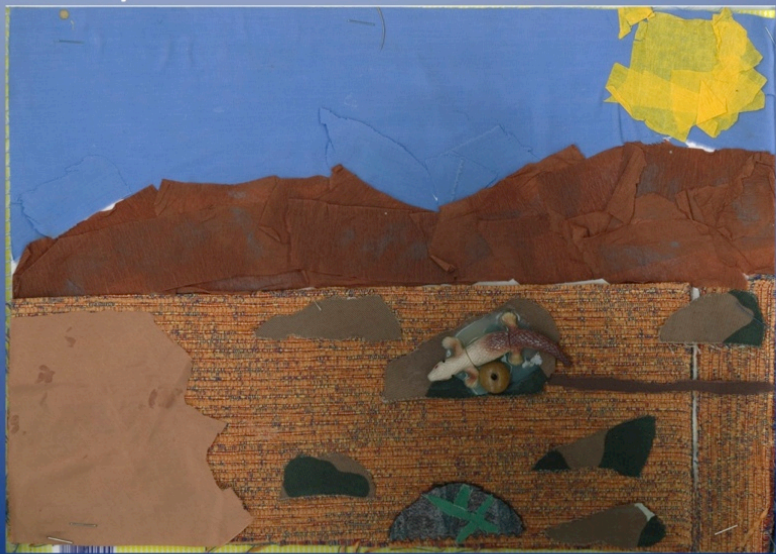
The community group explored contemporary pedagogies within the context of the spiritual beliefs. Trying to fit an existing theory to this new learning community became problematic. Rather, a grounded approach was taken based on an understanding that there is a reciprocal relationship between physical and psychological environments.

During the design process a range of spaces (cozy caves, open light filled watering holes) were explored as metaphors for the various aspects of the learning community. These were tested with the community with accessible virtual 3D models, and then referenced throughout the building.

Flexibility of space was key to the layout of the building and surrounding spaces. Discarding set areas for computer rooms, libraries and gyms and instead using laptops with wireless internet connections, mobile resources and encouraging natural play allowed for the introduction of a large central shared gathering space.

Supporting Image 1

Learning community brief:
connection to earth, hills and sky



Supporting Image 2

Welcoming entrance:
visual connection from foyer to shared learning

Supporting Image 3

Shared learning space:
learning display for all ages

Appendix B

Deepwater (2007) Grounds policy: draft for community consultation. Page 5.

Values

NURTURING LEARNING

A growing body of persuasive evidence relates the vital, and perhaps irreplaceable role, direct experience of nature plays in human development. The physical qualities of school grounds also strongly influence student’s physical, cognitive, emotional and social wellbeing. For example, studies form the UK, USA and Canada show that naturalised school grounds improve student-learning outcomes in all curriculum areas and provide safer, healthier and more inclusive places. Significantly naturalised school grounds also have the effect of increasing student cooperation, collaboration, enthusiasm, engagement and creativity (For more information see Appendix 2).

Deepwater Grounds Committee therefore recommends that:

- ‘nature’ is incorporated in all play and learning areas.

CATERING FOR DIVERSE NEEDS

As children grow and mature their particular landscape needs change. Deepwater's grounds committee is aware, however, that research shows primary school children look for school grounds with:

- *Places for doing. Offering opportunities for physical activities, developing new skills, finding new challenges and taking risks.*
- *Places for thinking. Prompting interest, intellectual stimulation, exploration, discovery and learning, alone and with friends.*
- *Places for feeling. Engendering a sense of ownership, pride and belonging. Children care for the place and people in it and feel cared for themselves.*
- *Places for being. Promoting sense of safety, allowing children to ‘be' themselves, to be quiet alone or alone with friends.*

Deepwater's Grounds Committee therefore recommends that:

- each development plan incorporates one or more of the above qualities
- special interest learning areas be identified. These could include: play equipment, sensory garden, woodland meadow, frog pond, vegetable garden, orchard, wetland, cubbies, creek, compost, worm farm.

INVOLVING COMMUNITY

People appreciate environments differently so the effective provision and management of school grounds requires a *detailed knowledge and understanding* of learner needs, child development and teaching practices.

Deepwater Grounds Committee therefore recommends that:

- all stakeholders participate in planning and management decisions that relate to the grounds
- the above processes should be conceived and implemented as learning activities.

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