Chapter 1

Digital games and learning: modelling learning experiences in the digital age

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Introduction

The wide uptake and pervasiveness of leisure games, which over the last ten or so years has permeated all areas of society, has resulted in the emergence of a new paradigm whereby gaming and gaming technologies are having greater possible applications in non-entertainment contexts of use. A general tendency of games being used in non-entertainment contexts harks back to its earliest uses as war simulations, where military groups used games to mock up real battles thereby allowing them to prepare and rehearse skills in advance of active combat. Games and simulations for training even in these earliest instances offered real potential for rehearsal of skills of individuals and broader practice for coordinated actions in groups which, in more recent times, has given rise to initiatives such as Montessori games that have been described by at least part of the educational community as a highly effective form of learning. However, in the past these opportunities for learning through games were relatively rarefied and modern advances in technology and network connectivity are opening up more pervasive opportunities for using games for learning, to the extent that today game-based learning and simulation approaches can be used to re-organize the basic critical categories of learning in formal learning and professional training contexts.

The extent of this transformation might be considered, not just as tools for glossing conventional training and learning, but for setting up a substantially new paradigm, one where games for learning re-organize the critical constructs of learning from information and knowledge units that are sequenced for learners in curriculum formats, to learning as experiences and apprenticeships. This allows learning to be choreographed and re-sequenced according to the personalized and specified requirements of the learner. In this way, peer learning, self-assessment and game-based approaches can support social interactive learning opportunities, greater learner empowerment and user generated content (de Freitas & Conole, 2010). If game-based learning does provide a real transition for learning in formal and professional learning contexts, what conceptual work can this be based upon, and how can this existing work be extended and developed? Towards understanding and building upon this posited shift, this chapter therefore explores and analyses some of the supporting conceptual work around game-based learning with respect to its application in formal and professional learning contexts.

In other work, the locus of the posited transition seems to be the notion of a *learning experience*, rather than the creation and use of a set of linear texts. While the learning experience can encapsulate and include textual components, and can be linear in presentation, the critical construct of learning is rather about the learning experience *per se* (e.g. Kolb, 1984, de Freitas & Neumann, 2009).

More recently with the emergence of computers and internet technologies, new gaming and simulation formats, e.g. serious games, are transforming the potential of learning by providing scope for learning in different contexts, over great distances or for supplementing conventional teaching techniques. In addition, the wider availability of broadband has created new opportunities for online collaboration and social interactive learning, as well as supporting more media-rich content for streaming and interaction. Building upon more constructivist approaches, e.g. Kolb, 1984, one of us has elsewhere put forward the notion of learning components as changing towards a critical construct of ‘learning as experience’ (de Freitas & Neumann, 2009). The recasting of ‘learning as experience’ foregrounds two major areas for consideration: the role of social interactive learning (learning in groups) and the role of learning design (designing experiences rather than content). These two areas

present two major challenges: how do we support better opportunities for team learning and how do we provide and develop tools for facilitating tutor authoring of experience-based and exploratory learning scenarios and quests.

Many of the recent responses to these two challenges have come from what might be regarded as the training side of learning and education, especially in military training applications, such as *America's Army*, where game elements have been integrated into simulation-like formats for supporting deeper learning in particular of tasks and skills, and often consistent with more 'associative' modes of learning (Mayes & de Freitas, 2007). The success of these approaches has led to greater involvement of users, (particularly in the social groupings so typical of multi-user virtual environments – MUVEs), and in parallel with larger numbers of learners playing games in their spare time, the appeal of game-based approaches in non-entertainment contexts has broadly increased.

The uptake of these approaches in training situations has been stimulated, at least partly, due to the imperative of effective training, but the expense of using these tools has led to its use in areas with larger student cohorts and where funding is not limited. Generally, areas of early adoption have been characterized by larger cohort numbers, e.g. the military. Larger numbers of learners have balanced the higher costs and technical knowledge previously required for running more complex simulations and game-based approaches. Thus in these contexts, training needs are matched by economic viability and rationalized due to the urgency of training needs. For example, medical training and surgical training are complex and are so critical that lives can be saved or lost on the basis of correct training. This necessitates the highest quality of training and simulations in this area have had to respond to this direct challenge. Indeed so sophisticated have the simulations become, in the field of pilot training for example, that simulations here are also used in post-incident analysis to investigate the probabilities of pilot decisions in particular situations. The classic case was the investigation into the ditching of US Airways Flight 1549 into the river Hudson in January 2009. Four simulated flights by experienced pilots of the exact conditions of the flight, with its complete loss of thrust soon after leaving La Guardia airport, confirmed that the pilot, Chesley Sullenberger, had indeed made the only choice of the three open to him at the time that would have saved all 155 passengers (Greenspun, 2010).

Sectorally then, the adoption of game-based technologies, and latterly virtual world technologies, has broadly followed similar curves of uptake, often associated with higher imperatives for efficacy: military, medical, business and then later on education. Particularly, the slowness of uptake of these approaches in primary, secondary and tertiary education is also partly due to the fragmental nature of education, training needs of teachers and tutors, and a disconnect between research and teaching. Political aspects have also provided a general resistance to uptake of new technologies in formal learning environments, as several chapters in this book attest.

The use of games and in particular simulations in high critical training contexts has however provided an implicit endorsement of the innovative training techniques. However these have not gone unchallenged and in the past the absence of empirical evidence to support the efficacy of in particular game-based learning, which is not so close to real-life and more simulation-based approaches, has held up development and diffusion of the tools. However, what the development curve has indicated is a predominance of usage in critical training areas and this has at least provided anecdotal evidence of the effectiveness of multimodal approaches to learning that is learning that appeals to more than one sense. Furthermore, indications of promise in areas of motivation, engagement and empowering learners through feedback mechanisms indicate the power of immersive experiences for supporting accelerated learning and supporting ease of learning transfer (e.g. Griffiths & Guile, 1999; Jarvis & de Freitas, 2009). One of the reasons for this success may well be via the proximity of training to the live application of the training, e.g. in emergency response, surgical training etc. Where training is closer to the live practice then generally the learning transfer tends to be smoother. Immersive learning techniques, including simulations and game-based approaches then have had more success in permeating professional learning, aiding with pre-work and with particular strengths for rehearsal and role plays (e.g. Haskell, 2001; Parush, Hamm & Shtub, 2002; Kato et al., 2008).

While the lack of empirical evidence and the cost of game-based approaches has in the past slowed the uptake of the technologies, more recently studies such as the 'Serious Games – Engaging Training Solutions' and the 'Hope Lab Re-Mission game' (Jarvis & de Freitas, 2009; Kato et al., 2008) have proven empirically the efficacy of game-based learning over conventional methods. This

work has set new agendas for game-based learning and opened up new methods for assessing and evaluating games for learning (e.g., four dimensional framework, de Freitas & Oliver, 2006; RETAIN framework, Gunter et al., 2008).

In summary, then, several aspects of the complex learning and training environment are stimulating a wider uptake of game-based approaches: the reducing costs of developing game content, proof of efficacy of game-based learning for providing significant improvements over conventional learning methods, wider social use of games for entertainment uses and the wider deployment of the immersive learning techniques in critical training contexts. Together these factors lend support to the premise that game-based learning is a valid and tested approach for supporting formal learning approaches. However to embed game-based learning into formal contexts of learning and into professional learning two main challenges need to be considered. The two main challenges of exploring the role of social interactive learning and learning design with games thus provide a broad stroke research framework for exploring the main strengths of game-based learning, and may help to overcome some of the residual impediments to uptake, particularly in mainstream formal learning contexts, such as school and university.

Despite the pervasiveness of entertainment games amongst young people, broadly speaking, it would probably be fair to say that academic institutions have been reluctant to take up the new tools due to the reasons outlined above. Furthermore, where game-based approaches have been adopted, expectations for all learning to be game-based, immersive, fun and engaging provides a real challenge for learning practitioners because of the low amounts of available serious game content. With increased demand, this may lead in time to the repurposing of existing game content, and to the growth of the games content markets, leading to the growth of middleware tools for scenario authoring and editing and to the expansion of user-generated content that focuses upon mash-up applications and technologies (Protopsaltis et al., 2010).

Following this tendency, our chapter sets out to explore two issues in the design and implementation of digital games and learning in professional learning contexts:

1. why is it so difficult to implement play learning and simulations within formal institutional and disciplinary cultures?

2. how can games be used more effectively to facilitate professional learning?

While there remains much research to be carried out at a fairly basic level on how play and learning inter-relate, it is clear that the relationship is a complex one (Oliver & Pelletier, 2004). In immersive 3D contexts, learning more closely resembles play whereby engagement and motivation support more exploratory and unstructured play, rather than traditional approaches to learning, which more usually focus on formal provision and accumulation of data. The transition here is predicated upon the notion of 'learning as activity' constructing experiences that are more immersive and engaging, leading to greater ease of recollection and memory recall. Like memory palaces used to remember large amounts of data, spatial engagement and multisensory interaction replicates lived experiences and therefore becomes a powerful learning and teaching tool. To re-create these activities and exploratory modes involves a different way of thinking about learning and designing learning centred rather more upon designing experiences. This approach to designing learning experiences leads in turn to the definition of the experience *per se*, and to the representation of the learning environment, or *diegesis*. This is the story world of the game or immersive experience, which then becomes a key construct, mediating the processes of learning through play and providing an environment for social interactions to take place. The process by which learning can be designed in this context then is one of 'choreography', creating activities and tie-ins between the world inside the game and the world without (de Freitas & Neumann, 2009).

When considering the implications of play as learning in formal educational contexts, there are substantial barriers to uptake of games technologies that stem from the identification of learning with sets of specific pre-organized structures and relationships. Traditionally, our conception of learning has been associated with formal curricular structures, information dissemination and retrieval, formal

and regular time patterns and formalized relationships of teacher and pupil, where a hierarchy of power relations is implicit in the sets of learning processes and relationships. A choreographic approach demands a reworking of how we think of learning. It demands conceptual shifts as well as praxis shifts to the infrastructure and practices of learning. We argue that this requires a substantial revision of our current education system such as learning sessions, curriculum structures and formal educational structures, even departments and disciplinary boundaries need to be revised and reconsidered. This shift is an easy one to resist in organizations that are more traditional and older, in part at least explaining the reticence of staff and organizations to adopt game-based or immersive learning approaches. Learners however are not so reticent and are adopting the social technologies at least in their spare time – one of the main drivers for this transition then can be observed to be generated from the students and their interest in different social forms of interaction (de Freitas & Conole, 2010).

The socially-driven changing relationship between the praxis of teaching and learning and disciplinary structures is particularly pressing for those fields where academic knowledge requires to be transmuted into professional knowledge. A significant proportion of the games and simulation literature has proved how second-order symbolic thinking typical of academic learning can be facilitated by simulated activities based upon professional practice. In Law, for instance, the debate is part of the larger question about the identity of the modern liberal law school, with its emphasis on conventional teaching and learning, on the predominance of research over teaching, the hegemony of liberal attitudes to disciplinary content, the separation of academic from professional learning, and a cautious attitude towards engagement with society at large (Bradney 2008; Burridge & Webb, 2008). Contrasting with this are models of Law School development that foreground relationships between students and with society, that promote forms of pedagogic intervention that derive from the practice of the profession in society, whilst providing a critique of that professional practice. Above all, such Law Schools lead the way in the development of new forms of teaching and learning, including problem-based learning, simulations, games and clinics (Maharg, 2007).

The debate that exists in the discipline of Law has its analogue in many other disciplines; and the place that student voice has in the debate is increasing through platforms such as the National Student Survey. Eraut has commented on what universities and colleges, for their part, need to do:

> The barriers to practice-centred knowledge creation and development identified … are most likely to be overcome if higher education is prepared to extend its role from that of creator and transmitter of generalizable knowledge to that of *enhancing the knowledge creation capacities* of individuals and professional communities. This would involve recognizing that much knowledge creation takes place outside the higher education system, but is nevertheless limited by the absence of appropriate support structures and the prevailing action-orientation of practical contexts (Eraut, 1994, p.57).

Eraut's conclusion stems from the analysis of the academic and professional traditions of dealing with knowledge acquisition, production. He points out how the context of learning profoundly affects what is learned, to what purpose, and the effect of context on knowledge transfer:

> ... the context of use also affects the learning of theoretical knowledge, and ... it is misleading to think of knowledge as first being acquired and then later put to use. Not only does an idea get reinterpreted during use, but it may even need to be used before it can acquire any significant meaning for the user. Thus its meaning is likely to have been strongly influenced by previous contexts of use; and the idea will not be transferable to a new context without further intellectual effort (Eraut, 1994, p.51)

Context, in fact, affects knowledge to such an extent that it may be said to fundamentally alter the epistemological features of learning. Eraut observed as much in commenting upon the learning of professional knowledge:

> [P]rofessional knowledge cannot be characterized in a manner that is independent of how it is learned and how it is used. It is through looking at the contexts of its acquisition and its use that its essential nature is revealed (Eraut, 1994, p.19).

This perceptive comment leads Eraut shrewdly to suggest that educators 'should treat the compendia of standards resulting from functional analysis as foundations for course design rather than substitutes for it' (ibid, p.213). Standards, in other words, should be the springboard for imaginative and innovative learning design.

More widely, Eraut's observation regarding the inextricable links between action, context and knowledge is supported by much of the findings from the literature on situated learning, as well as the literature on professional learning (Brown, Collins & Duguid, 1989). The powerful conservativism of dominant professional modes of learning, in which one may include universities, has been analyzed in some depth by Lee Shulman in his concept of the 'signature pedagogy'. Shulman recently applied this concept to legal education in the Carnegie Report (Sullivan et al., 2007). The signature pedagogy has four features: a *surface structure* with observable, behavioural features; a *deep structure* with underlying intentions, rationale or theory that the behaviour models; a *tacit structure*, with values and dispositions that the behaviour implicitly models, and a *shadow structure* - the absent pedagogy that is, or is only weakly, engaged in the current pedagogy (Sullivan et al., 2007).

It might be easy to misunderstand Shulman's descriptions of these characteristics as static pedagogical qualities. But as he has described a number of times elsewhere, the four qualities are in dynamic tension with each other, constantly interrogated, constantly morphing. Also, as he points out in a keynote address,

> the "signature pedagogies of the professions," are not eternal and unchanging. Even though they seem remarkably stable at any one point in time, they are always subject to change as conditions in the practice of the profession itself and in the institutions that provide professional service or can undergo larger societal change (Shulman, 2005).

The surface structure is thus in tension with the deep structure, because if underlying intentions change, then this can affect surface behaviour. Surface structure, though is often the only observable way of understanding the deep structure – it is certainly so for students working through the curriculum and for educational researchers it is indicative of deep structure. Tacit and deep structures

seem to be the same, but are not: tacit refers to values that feed into surface behaviour, but which can alter surface behaviour as well; and the reverse is true, in that reflection on surface behaviour can lead to recognition of and possibly a change to aspects of deep structure. For example, teachers realizing that certain forms of teaching are having certain value effects on students. And of course the shadow structure is in constant tension with the hegemonic dominance of all other three. Seen like this, a 'signature pedagogy' is less a stable landscape and more of a seismic region, always threatening to fissure, under cultural, economic and educational pressures, one of which is created by its own modal dominance as signature.

What is interesting about Shulman's subtle construct, then, is that it explains the general features of pedagogies, both as they are and as they change in society. Nor are signature pedagogies limited to the professions, though often the professions provide the clearest examples of methodologies mature enough to be called 'signature' – problem-based learning in medical education, or the case-method in US legal education, for example (other examples are outlined in Woeste & Barham, 2006; Bryant & Milstein, 2007). A 'signature pedagogy' can form in any discipline and in any type of learning encounter. Shulman's model also accounts for the tensions of competing discourses in pedagogical theory and practice: the established pedagogy in opposition. It therefore accounts for the micro-shifts within a hegemonic pedagogy and the power and effects of that pedagogy.

Shulman's model, being largely descriptive and analytic, gives us the tools to understand the process by which a signature pedagogy comes to dominate a discipline. However it does not indicate what might be required to effect transformative change within a pedagogy. This area of research is highly complex, but there is general agreement that change will be effected less as yet another list of values or competences rather than the negotiation of values and the management of that conflict. Two issues arise from such negotiation.

First, interdisciplinary educational research is important to the change process, as is the way in which the results of such research are implemented in curricula and institutions. The research literature on play and learning has yet to grow into a mature research domain: of its nature, it will be

interdisciplinary, and the domain as with all such laminated research communities will need to give careful thought to the conditions under which its research is produced and applied (Shaffer & Squire, 2006; Maharg 2007). Some areas of research are obvious candidates for development. The substantial research on cognition in learning, for instance, is being developed in the field of MUVEs – see for instance Ang, Mahmood & Panayiotis (2007); Nelson and Erlandson (2008). And a good example of such interdisciplinary research is the work of Shaffer and colleagues (2005, 2006) who have developed 'epistemic games' that allow learners to experience ways of knowing, doing and being (an 'epistemic frame') that approximate the ways professionals learn through reflective practice (Schön, 1983).

Others in the past have shown how this can be done. In the domain of legal education, for instance, there has been a consistent critique of the dominant signature pedagogy in US legal education, namely the case-method. Part of that critique has emerged from research into composition and legal writing. James Stratman, following classic lines of research mapped out by Linda Flower and others involved in the New Rhetoric, examined how students actually read legal cases. Did problems in reading arise from readers' cognitive strategies, or from the structure and content of the genre, or from the encounter between the two? To research this problematic Stratman constructed professional roles for students – an advisory, a policy and an advocacy role – as well as asking some of his subjects to read as if they were students preparing for a law class. His findings were significant. The assignation of role affected understanding arising out of the reading task. Higher-level reading strategies such as problem-recognition and resolution were more apparent and were higher when students assumed one of the three professional roles, rather than the role of student preparing for class. These findings were confirmed by other studies – Deegan and colleagues – and confirm the meditational role that professional identity can have in fundamental learning strategies (see also Flower, Long & Higgins, 2000; Maharg 2007). Research such as this can be drawn upon and co-opted by those who advocate games and simulations, not to normalize the position of play strategies within a discipline, but to extend and radicalize the pre-existing research bases, enabling research to effect transformation of disciplinary and professional teaching and learning strategies.

Second, the relationship between play cultures of learning on Shulman's tacit and deep structures of a curriculum need to be analyzed and theorized. Examples will be given later in this chapter, but it is relatively easy to alter the surface attributes of a curriculum – for example, to embed a pilot project or design new assessments. It is much more difficult to change the deep and tacit structures. As with the deep grammatical structures of language, these undergo structural change only rarely and under significant pressure. The deep structure of a signature pedagogy then is composed of the theory or intention underlying the *explicit* behaviours of teachers and learners, while the tacit structure comprises underlying values and dispositions.

How might the 'shadow pedagogy' of play transform deep and tacit structures of signature pedagogies and conventional curricula? It may do so in two ways. First, it can enable new theoretical positions on learning to be developed, tested and implemented. We shall give examples of such theory in 'diegesis' and transactional learning. Second, it can enable the development of values that are important to a pedagogy or curriculum.

An example of such a value or quality might be judgment, which as a focus for learning and teaching has always been problematic for formal education. In one form or another the debates around qualities such as passion, virtue, wisdom, patience, foresight and humility are evidence of a profound debate about the nature of ethics and the place of moral philosophy within society's higher educational structures stretching back through the nineteenth century, through Enlightenment and Renaissance discourse to the Aristotelian distinction between *sophia* and *phronesis*. In their modern shapes, the arguments crystallized in Enlightenment educational discourse, particularly within the civic humanist tradition that was, as Pocock and others have observed, an essential ethical discourse for European moral thought (Pocock. 1975). As such, the arguments underpin many of our assumptions underlying the teaching of ethics in any professional domain.

Or ought to… For the truth of the matter is that, as Barnett (1994) and others have commented, qualities such as judgment do not often form the core educational values that they did for Kant, for instance. The *Critique of Judgment,* one of the key Enlightenment texts in the western philosophical

canon on the subject, has come to be treated as a text more fitted to aesthetics than moral or political judgment. Two modern thinkers, however, Hannah Arendt and John Dewey, saw in this text the essential elements of the faculty of judging, which was important not just to the aesthetic process, but the political and the educational as well. To both, communication was critical: Kant stated that *Urteilskraft*, which can be roughly translated as the power as well as the art of judging, is something that is made apparent in communication, in the *sensus communis* of shared opinion and learning. Judgment enables understanding; linked to imagination, for instance the ability to see things from another's viewpoint, it enables plurality of understanding. As Kant put it, giving us a resonant statement of his social ambition for the quality that could serve as a definition for many other Enlightenment commentators,

> Egoism can be opposed only by plurality, which is a frame of mind in which the self, instead of being enwrapped in itself as if it were the whole world, regards itself as a citizen of the world (Young-Bruehl, 2006, p.167).

Both Arendt and Dewey, while paying respects to this social ambition and to Kant's work generally, disagreed with Kant's basic idea that moral judgment is not reflective but is deductive only. For them, the affective realm was a powerful determinant of judging in the political sphere (Arendt, 1982, pp.94-97) and in the educative realm (Dewey, 1980). But if the aesthetic and imaginative faculties play a role in judgment, no matter whether we take Arendt's or Dewey's re-interpretation of Kant, or indeed any other, then we would have difficulty in placing it within our contemporary curricular structure of learning outcomes. Barnett put this well:

> [w]isdom is not the only virtue that is having a poor time of it in the modern university. Patience, humility, generosity, perseverance, thoroughness, carefulness, quietness: these might once have been felt to be signs of a strength of character. No longer. In an age of self-promotion, self-presentation, visibility, efficiency, work-rate, personal performance indicators and sheer competitiveness, character traits such as these come to be seen as signs of personal weakness (Barnett, 1994, pp.151-2)

In order to change tacit values and deep structures we require significant theoretical, cultural and economic pressures equivalent to those that created signature pedagogies in the first place. We can contribute to that in the domain of play and simulation in our theory and practice, and this chapter, is an attempt to outline that process.

Transformational theory sets for games and professional learning

So far we have been discussing why it is difficult to implement play learning and simulations within formal institutional and disciplinary cultures The second question, how games can be used to facilitate professional learning, can be discussed in the context of two theory-sets. The first theory set creates a new representation of the inner life of a game – a diegetic model of play experience; while the second uses the construct of activity theory and transactional learning to build a model of context and engagement. They are each discussed below.

Theory set 1: play as diegesis

We have touched upon definitions of play and learning, and their similarities and dissonances above, while there can be no definitive conclusions here, the idea of centring learning upon experience rather than shared curricula focuses perhaps upon the key relationships between play and learning, social interactions and social drivers. For animal play, the intensive periods of play lead to accelerated maturation (Bekoff and Byers, 1998). Studies have shown that no play in childhood and sociopathy may be linked (Bekoff and Byers, 1998). Undoubtedly, thinkers from Plato to Piaget have acknowledged the importance of child play in development cycles. Illustrating this perhaps, the neuroscientist Gerald Edelman has pointed to a 'cartography' of knowledge that is developed and tested during play time (Edelman, 1992) and through rehearsal and role play can be accelerated and improved. For humans, then, broadly play is associated closely with human development. While studies show periods of more intense play, when we consider how play works it becomes an elusive concept, however, and trying to define between learning and play can be difficult even for philosophers (e.g. Wittgenstein, 1972). However, from studies with games and game play we can

begin to analyze the processes of play-based learning and begin to consider how these processes can best be 'scaffolded' for individuals and groups of learners (Vygotsky, 1978).

The concept of *diegesis,* then, comes from the Greek word for narrative or plot, used in film studies to depict the world inside the film. The word is used here to depict the story world or immersive world within the game rather than in the film. The act of immersion or imagination exerted by the player (or reader or viewer) creates a believability that allows for 'flow' or imagination to cocoon the player and allow them to pass many hours without an awareness of what is happening around them. Narrative is a major aspect of this, as it supports a deeper engagement through the story the identification with the protagonist and within an activity, such as a quest or mission. Play in this context becomes an inner world, with believable social interactions and activities, vested interests and a physiological 'flow' designed specifically for engaging and maintaining the interest of the player (Csikszentmihalyi, 1991).

Further to this, play is, as it were, an inner world. *Diegesis* in particular, and play in general, opens up a new way of thinking about learning – that is thinking about learning as activities and experiences – designed to inform our life activities and professional experiences. Thinking about learning in this way, opens up a new way to connect with our cultural and historical life, but we still need tools to allow us to approach learning design in a way that is sensitive to this approach. One of the methods for achieving this practically is emerging from the work of the authors.

In previous work, de Freitas and Oliver (2006) outlined an evaluative framework for the selection, use and evaluation of games in formal learning situations. The work was based upon studies with tutors and learners identifying particular issues associated with the selection, use and evaluation of games. The framework, which was been mapped onto activity theory, focuses upon four main dimensions: the context, the learner, the representation of the game (*diegesis*) and the pedagogies used. The framework is based upon the notion that learning activities are the central construct of learning interactively with games and that these activities need to be considered in relation to experiential or exploratory models of learning, whereby the learner becomes an active participant in

the learning processes, e.g. producing content, sharing content working collaboratively and socially and having significant learner control.

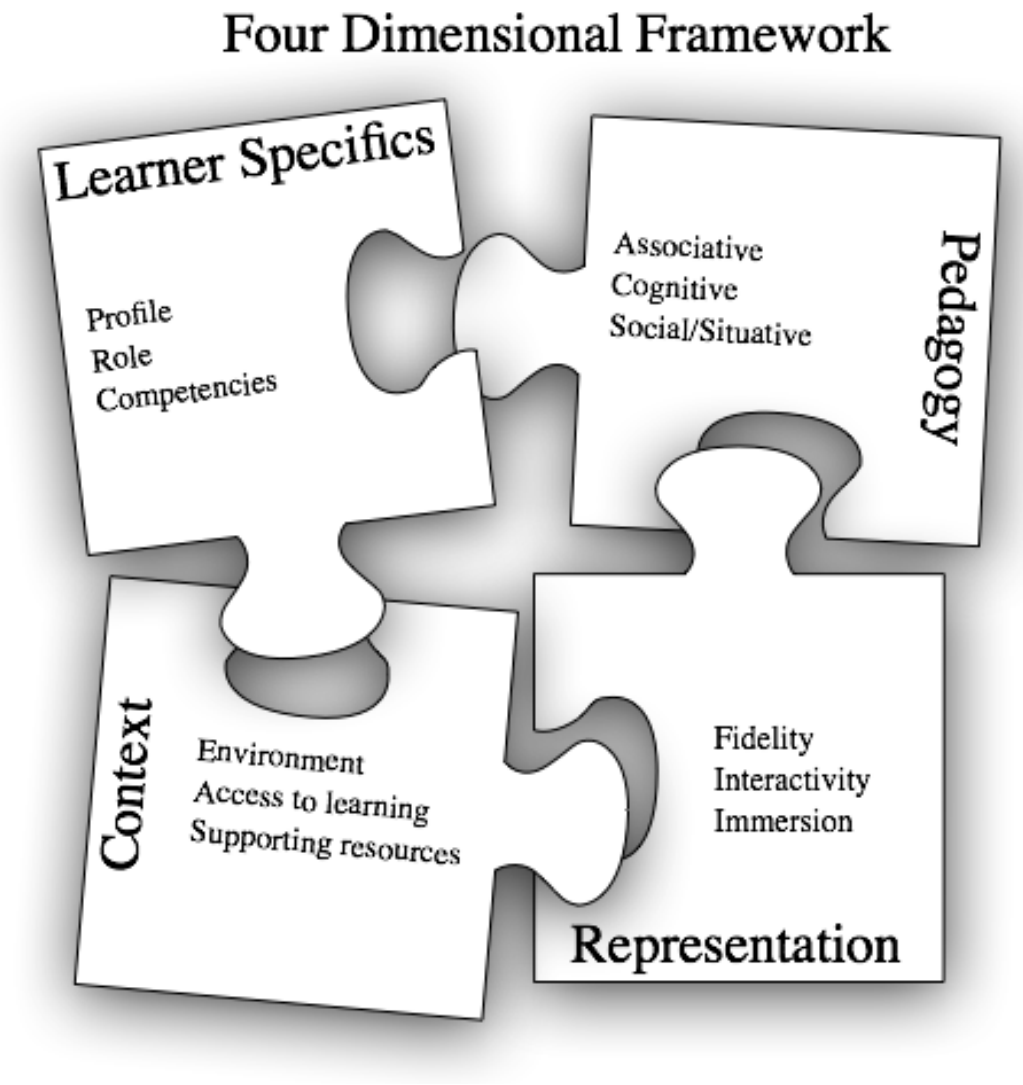

Figure 1: Four Dimensional Framework.

The framework includes a dimension that focuses upon the representational dimension of learning, and in the context of game-based learning this necessitates a consideration of the world within the game or simulation (or role play). In the context of the game then, the representational dimension focuses upon the internal representational world of the game or simulation. The *diegesis* means the presentation of objects and environments, the interactivity of the player within the game

and the levels of immersion and fidelity used in the game or simulation. In further work, de Freitas and Neumann (2009) have been developing an exploratory learning model whereby the efficacy of the game or immersive experience is predicated upon the levels of immersion, interactivity, liminality and fidelity of the game.

The diegetic play of the game then relies upon specific levels of immersion within the representational dimension. How high does the level of fidelity need to be? How interactive should it need to be to convey a realistic experience, what is the role in the role play and how accurate does that need to be? What narrative structures need to be used? An element of repetition, quizzes and quests are just a few devices that can be threaded together in the game design to ensure engagement and motivation of the students playing the game. Diegesis then becomes the game play, how the environment and narrative is structured then supports the immersion and flow. All support a designed experience that is addictive and engaging, whether painting a picture of a historical period or learning to pilot aircraft, learning and rehearsing skills in an immersive environment relies upon the learning design, and importantly the fidelity and believability of the environment, the actions within the environment and the social interactions between the characters, whether they are player or machine driven. The drive for diegetic cohesiveness then leads in tandem to the drive for ever more realistic environments and with computing processing improving exponentially this is an achievable goal.

Through these kinds of interchanges, play becomes the active diagram of learning in the world of the game or simulation, indeed play becomes a supporting aspect of the *diegesis* of the virtual experience.

Theory set 2: CHAT and Transactional Learning

Activity theory's basic meditational triangle can be used in order to understand the complex factors affecting the embedding of simulation within professional education. Engeström (1999) developed this model to include the social and cultural context in what he called a cultural historical activity theory (CHAT) framework, as follows (Figure 2):

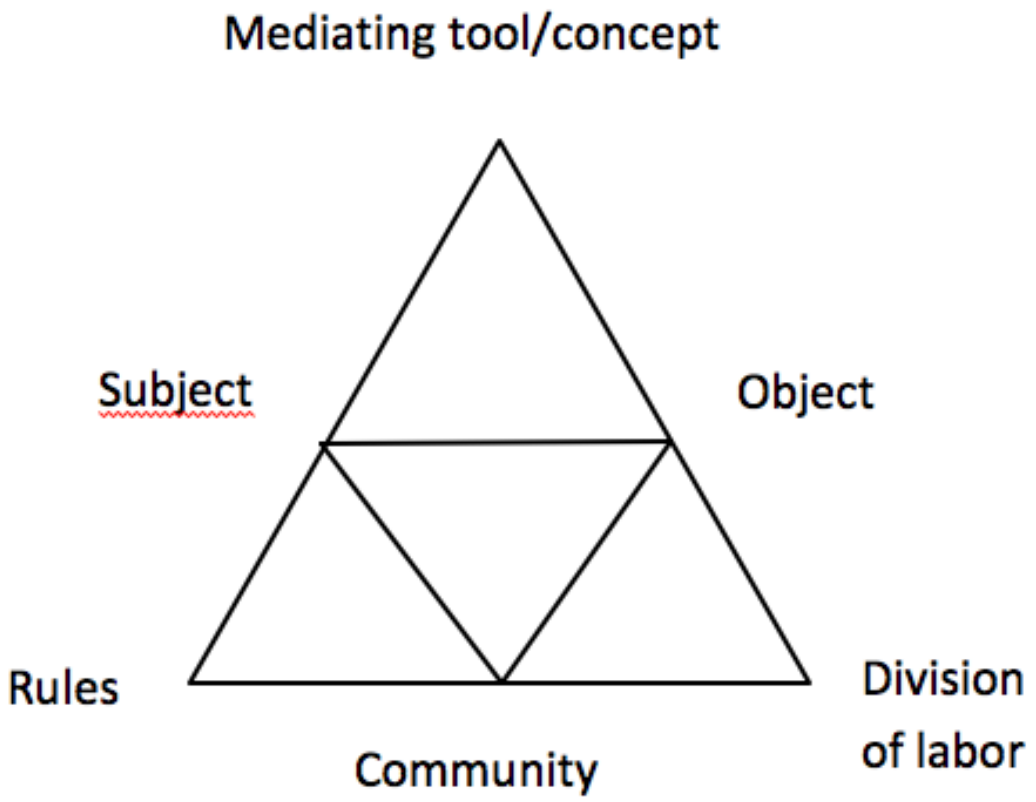

Figure 2: Engeström's model of mediational activity.

Engeström's model is a generic tool that can be applied to most areas of professional learning. The approach has been further developed by Barton, McKellar & Maharg (2007) in the context of simulation learning within a professional practice programme in Law. Using the dialectical movement of Engeström's triangle as their basic unit of analysis, Barton and colleagues analyzed their educational practice and its affects; and the following diagram describes their model (Figure 3):

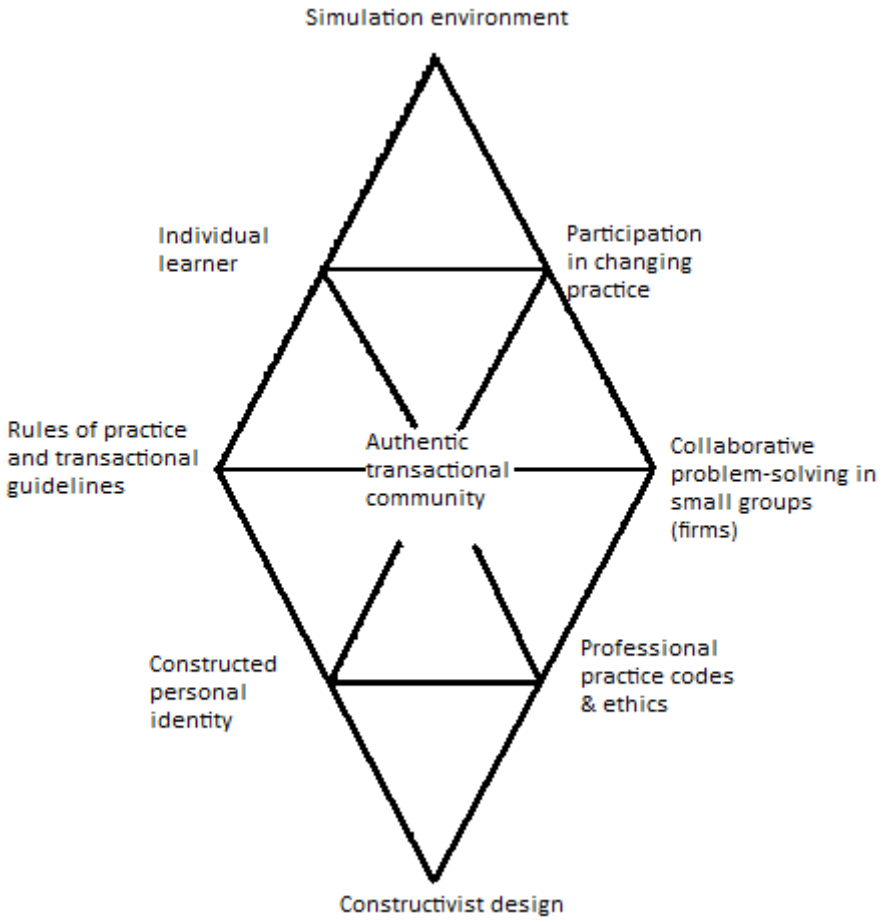

Figure 3: Barton, McKellar, Maharg (2007) – meditational activity in transactional learning

The diagram applies to any professional learning context. In the basic meditational triangle at the top, we move from subject, through meditational tool or concept use, to object, namely participation in changing professional practice. Practice refers not just to the quotidian reality of professional transactions, but to those practices and personal understandings that students, trainees and newly-qualifieds require to change if they are to enter the world of practice. The rules (mid-left in the diagram) are those of the practice community, together with the resource-base and guidelines given to students as part of their learning environment. The community (centre-diagram) is that of transactional learning. The division of labour by which such change is achieved is through collaborative problem-solving in small groups – a feature of the transactional environment that we shall describe in more detail below.

Underlying this structure is the critical element of personal identity construction and change that takes place when a student participates in a professional course. It is essential that any constructivist design enables such change, and therefore it is appropriate that the learning design is seen as a mediational element in the process. But mediation is also the role played by the authentic transactional community – the community that willingly suspends its disbelief, enters the transactions and performs them as if they are actual transactions. The community, too, plays an important role in mediating the understanding of professional ethics.

The diagram can be seen as a version or adaptation of the classic CHAT framework and describes many of the contextual features that affect the implementation of play or simulation within situated learning activities (Lave & Wenger, 1991). But in addition it can be seen as a mirroring of the CHAT isosceles triangle, where constructed personal identity, through the medium of the transactional community, learns the effect and consequences of enacting professional practice codes and ethics, but where constructivist design is also essential to this mediation. Indeed, a vertical line can be drawn through the CHAT framework from constructivist design through a transactional community to the simulation environment: all three are essential to simulation activity.

Moving up to the central horizontal line of the diagram, the rules of practice and transactional guidelines, mediated by individual students' constructed personal identities, make up the transactional community. The community, mediated by professional practice codes and ethics, manifests in collaborative problem-solving in small groups.

In addition to the mediatory movement of the dialectical triangle there is also a circular movement around the inner rectangle that describes the process of identity-formation within a structure of professional practice ethics. In the example of professional ethics, then, the individual learner constructs personal identity through the process of entering practice codes and values, and understands professional ethics through participation in changing practice. Through both the rectangle and the triangle, the model places emphasis upon the social interactions of learning that take place

within professional cultures and, we would claim, supports greater learning transfer and also accelerated learning within the stages of that culture.

The last claim is an ambitious one, but as the recent report on the SIMPLE project makes clear, there is an evidence base to support it (Gould et al., 2008). A re-interpretation of Engeström's activity theory such as we have above has profound implications for the shape of professional curricula. But if a diagram such as this represents the cultural and historical framework of simulation learning, we also need to consider its practical implementation within a curriculum. It is here that the concept of transactional learning can be useful.

Transactional learning, as defined by Maharg and others, involves simulations and games, and has seven characteristics (Maharg, 2007; Barton & McKellar, this volume):

1. **active learning,**
2. through **performance in authentic transactions,**
3. involving **reflection in & on learning,**
4. deep **collaborative learning**, and
5. holistic or **process learning,**
6. with **relevant professional assessment,**
7. that includes **ethical standards.**

The concepts work best when they interlock within the curriculum. Authenticity is central. Transactional Learning cannot of course be a *mimesis* of real professional life but it can (re)construct aspects of it to enable immersive gaming and simulation to take place. Performance within the game is part of what creates active learning, but professional performance is rarely a singleton activity: it nearly always involves others, either as actor participants or as audience. Extensive collaborative learning (point 4) and active learning (point 1) are therefore complementary activities, as is the concept of process learning – point 5, learning how to carry out aspects of a transaction – with reflective learning. Point 3 involves stepping back from the transaction to think about relationship

processes and affect as well as professional projection in the world of the transaction. If Transactional Learning depends upon professional activities to provide the ground upon which learning takes place, then learning is reinforced when its assessment also takes place upon this ground (point 6). Finally, no substantial transactional activity in the professional world takes place unless within an ethical context. Transactional Learning emphasizes the ethical underpinning not just of transactional activity, but also of the relational ethics underpinning all prior six points. Learning, in Transactional Learning, thus becomes acknowledged as an essential component of professional activity.

Transactional Learning, in this way, provides a blueprint for the design of learning and assessment within the broader framework of CHAT theory. It sets out the qualities that such design aims to bring about in games and simulations in professional learning. Moreover, it enhances the qualities of diegetic learning through the emphasis upon social interactions constructed environments and active learning strategies. The design of learning in this way allows for a scaffolding not just for learning construction but for a more socially driven set of determinants such as interaction, immersion and ease of learning transfer through close to reality representations, activities, role play and rehearsal.

Diegesis and CHAT / Transactional Learning are two theory sets that are complementary in their emphasis on immersive action, action learning and their applicability to professional learning. There are at least five points of contact that could be further explored:

1. Play learning is social. Much of the literature into online multi-user virtual environments (MUVEs), for instance, supports this (Taylor, 2006; Salen & Zimmerman, 2004; Steinkuhler, 2006);

2. The theories are representational in character. That is to say, they describe how learning happens within games, and how it can be recovered, re-used and transferred;

3. They give designers generic guidance on game and learning design processes and procedures;

4. They focus on the convergence of play-representation and reality-representation;

5. They emphasize transformation of curricular practices. Play offers the opportunity to rethink curricular practices, learning resources, assessment practices and even employment hierarchies within institutions.

In the introduction to this chapter we exposed the recasting of 'learning as experience' as foregrounding two major areas for consideration: the role of social interactive learning (learning in groups) and the role of learning design (designing experiences rather than content). In the final part of this chapter we shall briefly describe a case study that exemplifies the convergence of the two theory sets in relation to social interactive learning through the lens of transactional learning, and in relation to learning design through the lens of *diegesis*.

Diegetic and transactional dimensions in the SIMPLE case study

One example from practice will give an indication of what we mean. The Law School at Strathclyde, on a postgraduate programme in professional education, runs a Personal Injury Negotiation Project with its SIMPLE (SIMulated Professional Environment) in which students, working collaboratively in virtual law firms, represent either an employee injured at work, or the insurer for the University of Ardcalloch, where the accident occurs (Barton & Maharg, 2006; Maharg & Owen, 2007). One year, two firms had difficulty completing the transaction. At the point of closing negotiations, one firm introduced another very substantial head of damages to be considered. The other side was, not surprisingly, vexed by this. They emailed their tutor (the following are extracts from emails):

> We agreed to negotiate on 6 heads and are now being asked to negotiate on 7, the 7th being the most substantial. This is an underhand tactic by the pursuers and to act in the best interests of our client we would need to investigate this head […]

The tutor responded:

> Well, it might be underhand or it might be just incompetence – hard to tell at the moment. It certainly poses a dilemma for you. But actually, it poses a dilemma for the other side even

more. Read [another tutor's] recent postings on the discussion forum: this situation can be turned to your advantage. They [the other firm] have put you in a situation where you are under pressure, for if you're to act professionally you need time (for client instruction, new investigation, etc). You have a range of options – for instance: 1. do what they want, research & obtain instructions frantically in the time that is left to you; 2. refuse to give in to such pressure, while remaining co-operative and prepared to negotiate the point, e.g. either they accept a greatly reduced figure, or nothing at all, given the circs; 3. show them how angry you are, send accusatory letters, refuse to negotiate under such conditions. What will be your choice? Or rather – since it is so easy to get caught up in your own personal feelings at this point – what would be best for your client?

After a pause the firm responded that they decided to choose the second option and had agreed to a face-to-face meeting to negotiate. In the same email they went on to relate the difficulty of finding space in diaries with upcoming assessments, ongoing difficulties with the other firm, and then asked,

> What sanctions can we impose if there is no settlement on Friday and negotiations continue into next week? In real life we would have additional clients and may in fact need to turn down fee earning work to deal with this situation. In addition, our client would not be pleased about the additional expense. […] Can we agree to Friday, that is if the pursuers ever get round to arranging it, and tell them should the negotiations continue into next week that we will reduce any agreed settlement by say 10% in addition to contributory negligence for the inconvenience and additional expense to our client?

The tutor responded:

> You choose whatever you want to do. And this is where things become, from the point of view of professional actings, quite difficult. Because if you are going to go down route 2, it is probably fair to say that if you insist on sanctions and punishment, you may scupper any deal-making activity you are engaging in. You're edging into route 3. You are perfectly right about

the extra time you are spending on this. But in the interests of getting the best deal done for your client, you will need to ask yourselves whether this really will be to their advantage.

And yet, when all is said and done, the settlement document signed and the file submitted you will probably still be feeling raw about this, as you are at the moment. Perhaps then would be the time to have a 'debrief' with the other side – to find out why this has happened – how they felt about it (did they do it deliberately? are they embarrassed, but keeping a poker face on the issue? totally unaware of any inconvenience?), and what could have happened differently. That debrief outside the bounds of the simulation can be quite a powerful learning moment. Tricky meeting to handle but it gives you good experience for handling such matters in the world of future employment…

This excerpt from student/tutor dialogue has many interesting features. First, note that it is saturated in the issues that arise from the simulation. Professional practice thus becomes the ground upon which powerful learning takes place. Second, the main issue at stake is what one firm construes as unethical behaviour on the part of the other firm and the firm members' anger at being treated in this way. The tutor outlines possible courses of action and in this sense is debriefing with the firm before its members return to the simulation to enact solutions on behalf of their client. There is active learning within the performance of the transaction. The whole exchange is an exploration of issues and possible actions that at times approaches Schon's reflection-*in*-action. Above all the firm is concerned with the ethics of the situation: what is ethically possible, feasible, how it will affect the outcome of the negotiation.

There is so much more that can be said about these and many other such exchanges. The emotional commitment to the play, the heartfelt exploration of alternatives that can be undertaken, the true difficulty of choice, the dealing with complex emotions, a deep understanding of what it is to represent a client professionally, sometimes in the face of unprofessional conduct – all this and much more cannot be learned any other way except through the play of professional activity within a simulation. Through such diegetic interplay, through immersion and dialogue about the transaction,

students come to an experiential understanding of what professional culture is, and how its ethics and values play out in transactions. In this way, students learn through activities the culture and history (to adopt Engestrom's terms) of their profession.

Conclusion

If a socially-driven paradigm shift in learning and training is to be argued for then certainly the recasting of 'learning as experience' is at its centre. While in the past teachers were restricted to the classroom and field trip, today with more advanced visualization tools, the internet with its capabilities for social networks and increased broadband connectivity for media rich-environments, immersive learning has become a necessity for critical training, and more recently for professional learning, allowing as it does the use of role play and rehearsal, formative assessment and collaborative learning communities. While the new tools are still relatively recent, the potential for learning in this way is gathering momentum. As games and simulations become cheaper to produce, and as more and more people are playing in the home, the use of these tools in places of work and education becomes less controversial. The two main areas of consideration highlighted here in the chapter: of social interactive learning and how it can be supported through transactional learning and *diegesis* supporting the role of learning design, allowing tutors and students to design experiences rather than content. The experiential is one way that we can resist the hegemonic dominance of conventional academic pedagogies and signature pedagogies, and bring out of the shadows the pedagogies of clinic, simulations and games that have, to date, had only a minority existence in our learning institutions.

If experience is core to this approach, what are the qualities that are required in order to transform education in Higher Education, and can we use games and simulations to achieve this ambitious aim? Cultural and historical context, as represented in a mapping of the field, is a helpful tool to understand how play learning might be embedded in professional learning. A representation of the life world of the game or simulation – its diegetic nature – is also useful. By using representation as a core construct of learning, as we outline in this chapter, we are asking tutors to consider the potential of the 3D world around them as well as the virtual immersive spaces accessed via the web. While imaginings, text and information were the critical constructs of traditional learning, we ask that

imaginings, visual spaces and social interactions become the critical constructs of new learning. This is based upon a true transformation of learning from learning as information provision and access, towards learning as play and exploration. The transformation may not be an immediate one for all tutors or learners, but the advantages surely open up a new frame of reference for learning and teaching practices and scope for real creativity and interactivity. In many ways, this new learning opens up a more dialogic basis that in some ways better reflects the experiences (both formal and informal) of life and living. When we think back to our childhood days what we remember is rarely the pages of text but more often the experiences of learning.

Looking to the wider context, this chapter has opened up a debate about how games, simulations and immersive learning can inform and shape a new mode of learning, whereby learning is conceived of as activities and play, exploration and social interaction. The chapter has posed some of the key challenges for its wider adoption in formal learning contexts, but equally regards this new learning as a blend of mixed reality, with elements of real and virtual embedded and contextualized experiences. While experience refers not just to the Deweyan construct of experiential learning, but more generally a recasting of the relationship between learning within the academy and learning beyond it, this necessarily implies a transformation of the processes of learning and the educational infrastructure that underpins these processes. This chapter argues that it is through re-conceptualizing these core processes that we will be able to adapt to the challenges of immersive learning.

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