Does State of Being and Dynamic Movement have a relationship with Creativity?

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DECLARATION

This work has not previously been accepted in substance for any degree and is not being currently submitted in candidature for any degree.

Signed.............................................(candidate)
Date......28th January 2013.............

Statement 1
This work is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by footnotes and through explicit references. A full list of references is appended.

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Abstract.

Creativity research is a fast growing area of research. In our modern society there is recognition that creativity is becoming more and more important (Adobe Survey, 2012). David Bohm and David Peat applied a universal approach to explaining creativity. Peat and Bohm explain the movement that occurs in the creative process by way of intrinsic and generative orders. They also highlight the importance of ‘state of being’ and an interaction both externally and internally of a person in the creative process. Mihaly Csikszentmihalyi, who is a well-respected modern researcher of creativity, also includes aspects of state of being in his flow concept, as well as pointing out the importance of interaction and feedback from an external world.

This doctoral research series is based on three main factors - my 15-year self-study as a practising artist, an analysis of contemporary creativity and mind theories and empirically testing the key propositions that arise from these analyses in eight separate studies. The research explores whether there is a relationship between ‘state of being’, ‘dynamic movement’ and creativity.

The contribution to knowledge are clear definitions of ‘state of being’ and ‘dynamic movement’ and a practical application of these terms in the context of creativity. The methodology used to empirically explore the relationship of these propositions could also be regarded as a contribution to knowledge as it extends the triangulation methodology to include ‘dynamic movement’. The results from the eight studies start to show a relationship between ‘state of being’, ‘dynamic movement’ and creativity.
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Chapter 1. Introduction

1.1 Rationale for this study

This study really started off 15 years ago when I became curious about the creative process. I was curious for a number of reasons. I think the first reason was because I felt so calm and centred when I entered into my own creative process. As Csikszentmihalyi says at the beginning of his book *Flow*;

“Creativity is a central source of meaning in our lives, firstly because most things that are interesting and important and human tend to be the results of creativity. Secondly when we are involved in it we feel that we are living more fully than during the rest of life.” (1996, p.1)

This is exactly what I had found. When I entered into that creative space I felt more centred, calmer and somehow more alive. What started to pique my curiosity was that I had also experienced these feelings in another aspect of my life. I have been interested in religions and philosophy since I knew what those concepts meant. I had been studying many different religious or spiritual philosophies from when I started my tertiary education. When I moved to Singapore in 1993, I had the opportunity to experience Eastern philosophies first hand. I had started a meditation course at a Buddhist centre in Singapore and it was there that I had the same experience that I usually only had when I was painting. A feeling of being more alive, where time seemed to fall away and my mind was still. This intrigued me and I began to wonder if creativity and this ‘spiritual’ experience I had when meditating, might be coming from the same place. That is when I started to record my observations of the creative process. I started with just my own personal reflections at first but as I worked more with adults and children in art classes and workshops, I started to record my observations of other people’s creative process as well.
Over the years I managed to gather a rather large body of information and started to see some interesting common elements ‘bubble to the surface’ of my data bank of observations and reflections. I am very much in agreement with Csikszentmihalyi in saying that ‘creativity is a central source of meaning in our lives’. I believe he reflects the sentiments of great thinkers such as Henri Bergson, Poincare, Wallas and David Bohm amongst many others.

My reasons for taking my personal interest of the creative process to a more formal level, such as a PhD, are because I believe that this phenomenon has been put into the ‘too mysterious pile’ for too long. In the 1950’s Guilford called for a greater level of research of creativity (Guilford, 1950). Since then there has been an enormous growth of research in this area, but sadly the impact from this research is not so easily found in ‘real world settings’.

“Creativity has always been prized in American society, but it’s never really been understood. While our creativity scores decline unchecked, the current national strategy for creativity consists of little more than praying for a Greek muse to drop by our houses.” (Bronson and Merryman, 2012)

Creativity is a very complex subject so it is inevitable that creativity scholars have an enormous challenge but what is tragic is that, creativity is still seen very much as a ‘luxury’ pastime. This attitude towards creativity is evident in educational policies around the world where ‘creative’ subjects and approaches are being dropped (Robinson, K, 2011 talk given at learningwithoutfrontiers event in London; Creative Engagements Conference, Oxford, 2012). More than half of the 5000 people from 5 different countries surveyed in the Adobe ‘State of Create’ Study felt that the education system was stifling creativity (Adobe, 2012).

This type of policy making is very much a reflection of an attitude (which is the tragic part) that creativity is not seen as an inherently essential part of human nature, but more of a luxury pastime that people can engage in when the really ‘important matters’ have been attended to. This attitude was also reflected in the

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1 The author personally attended both of these events.
recent survey conducted by Adobe on attitudes towards creativity. Creativity was seen as important but less than half (39%) of the people surveyed saw themselves as being creative. The main reasons given as to why the participants were not living up to their creative potential was because of time and money. I wonder if creativity were accepted as an essential element of our lives, would time and money still stand in the way of our living up to our creative potential? Interestingly enough, in this survey, creativity was seen as being separate from being productive. Again this would seem to reflect an attitude that creativity is not essential and it also plays no role in productivity. The attitudes in this survey seem to illustrate some of the commonly held beliefs and priorities about creativity and the role it plays or should play in our lives. There are, however, a few concepts that have started to find their way into our everyday lives from the theoretical understandings we have of creativity.

Some of Graham Wallas’ concepts where he spells out the creative process in four stages, particularly the idea of incubation, have been embraced within the academic community (Wallas, 1926). Curiosity about what occurs in the incubation stage seems to have been reignited. This I witnessed recently at a Foundation in Munich, Germany, where they had just received a large research grant to look into the role that the subconscious plays in creativity.

Guildford’s (1959) concepts of convergent and divergent thinking have been incorporated into some areas of everyday society, such as classrooms, design centres as well as musical and artistic circles (Robinson, 2001; Gibson et.al 2009). One practical aspect of these concepts is the idea of brainstorming that is used widely in many different areas of society.

The idea of Csikszentmihalyi’s flow is seen as important to the creative process and is being used more and more in corporate environments (Csikszentmihalyi, 2004).
Gardner’s (1993) insights into great creative personalities have also contributed to more of an understanding of the creative genius. Amabile (1996) has made an impact with her theories of intrinsic motivation playing a role in the creative process. But these are really just ‘drops in the ocean’ of the understanding of creativity, considering the enormous amount of research that has been done in recent years. This discrepancy between the amount of research and investigation into creativity and the almost minimal impact that this research has had on the world at large, got me questioning why creativity still seems to fall under the veil of a mysterious phenomenon that can’t really be explained. I was also curious to understand why there is still the opinion that so few people are creative and that creativity was still seen as a luxury rather than a necessity.

As an artist and a mother of two children I am passionate about creativity and the fundamental importance that it has in our lives. As our world becomes ever more computerized and mechanized, one of the most sought-after skills in the future will be the ability to think in a non-linear manner (Robinson, 2010). To think ‘outside the box’ is a cognitive mode that currently is extremely difficult for computers to replicate, especially in the area of creativity. As competition to come up with more novel and original ideas to capture the market increases there will be a greater demand for original and creative thinking (Robinson, 2001 and 2010).

When we look at the amount of ‘stress related’ and ‘emotional’ illnesses that have started to become prevalent in our society:

“Two-fifths of employers said stress-related sick days had gone up over the past year” as stated in the survey by the Chartered Institute of Personnel and Development (CIPD) and Simplyhealth (Absence Management Survey, CIPD, 2012)

– we must stop and ask why this is happening? Bohm (1996) suggests that creativity is to the mind, as breathing is to the body. Could this increase of stress and emotional illnesses have anything to do with a society where the mind is unable to breath and where we are not listening to our natural instinct to create, as Bergson pointed out 100 years ago?
In the years that I have worked as an artist with children and adults in the field of creativity, it never ceases to amaze me how people’s eyes begin to sparkle and they begin to have a bounce in their steps, after having found an outlet for their creativity. As Sir Ken Robinson says; “when people put themselves in situations that lead to their being in the creative zone, they tap into a primal source of energy. They are literally more alive because of it.” (2010, pp.93).

Henri Bergson (1911) speaks of the Élan vital, or the living, creative force that he saw as driving evolution and also as showing up in mankind’s impulse to create. According to Bergson it is life in its creativity that unifies the simplicity of spirit, with the diversity of matter (1934/1946). Bohm (1996) says that “The health of the body demands that we breathe properly, so whether we like it or not, the health of the mind requires that we be creative.” (pp.29). David Peat says on the first page of his book *The Black Winged Night* (2000) that “Creativity permeates the cosmos. It is the driving force that sustains the elementary particles, the stars and galaxies, and even time itself.” This would imply that creativity is a great deal more than a nice pastime that some of us are able to indulge in.

I too, was intrigued by the idea of creativity as being a ‘central source’ or ‘primal source of energy’ that has a great deal to do with our well being and this is why I have undertaken this PhD - to begin to explore further the nature of creativity and whether or not it is an inherent element of our nature, that is crucial for our well being. Perhaps by exploring how closely linked the creative process is to our natural way of being, we can start to understand that creativity is essential to functioning in the world in a healthy and constructive way. By carrying out this research I may be able to support and expand upon the theories put forward by such great minds as Bergson, Poincare, Wallas, Peat and Bohm that have started to assert that our very state of being and how we move through the world are key elements of creativity.

By investigating these essential elements of state of being and how we move and interact in the external world and whether these elements have a relationship to

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2 Author’s word
creativity, then I may able to start to talk more about this relationship. This PhD along with theories already put forward may be a rationale to introduce the idea that such a relationship is not a unidirectional one. That is to say, that creativity may also be impacting the way we walk through the world, as well as on our state of being. Of course showing such a complex relationship is beyond the scope of this PhD but the exploration would be an important step that could then be built upon.

1.2 The Purpose of this study

To date, modern creativity research has been predominantly investigated in the realm of psychometric and psychological testing. Theses forms of investigation are very specific. Psychology has been the predominant discipline looking into creativity since the call by Guilford to look deeper into this phenomenon (Guilford, 1950). Research into creativity from within Psychology exploded and has yielded a great deal of information about the categorizations, personality types, ‘shopping lists’ of ideal conditions, systemic theories, levels and products of creativity as well as scope of creative output (Mayer, 1999; Kozbelt, 2010). But a universal understanding of this phenomenon still seems elusive.

When I first considered formally studying this phenomenon, I was asked why I would want to investigate such an area, when there seemed to be so much research already being carried out in the field of creativity. My answer to that question was that is the very reason I wanted to study it, as something seems to be missing. The mere fact that so much investigation had been done but so little impact has been seen in the world at large had led me to ask myself –why? We must be missing something if we have not yet managed to see a significant impact on our understanding of this phenomenon and the role it can play in our lives.

So my naïve and somewhat ‘arrogance of innocence’ led me to think that perhaps we were going about this the wrong way. Instead of breaking this phenomenon down to more and more categories and specific theories, maybe we needed to try a new perspective and see where that would lead.
This is also the purpose of this study, to introduce a slightly different approach to studying creativity; one where the ‘experimenter’ is not taken out of the picture but is very much helping to inform the direction in which we look. From this new perspective we can then begin to investigate in a spontaneous and perhaps even non-linear manner; therefore dynamic movement already starts to play a role.

Perhaps by moving in and out of subjective and objective views we can start to gain a better, overall understanding of an extremely complex and fascinating phenomenon. This approach reflects some of the principles Bergson introduced in his lifetime. In fact, his argument was so powerful that it led the great philosopher William James “to renounce the intellectualist method and the current notion that logic is an adequate measure of what can or cannot be”. James decided to give up logic as a method of investigation, as he found that "reality, life, experience, concreteness, immediacy, use what word you will, exceeds our logic, overflows, and surrounds it" (Williams, 1909). It is heartening to see that in the 1900’s there was a move to use life experiences to inform. Unfortunately, the objective, logical rationale won back favour and became the predominant ‘informer’ for much of the rest of the century.

However, there is much to be said about the wealth of information that we can glean from real life experiences and that is why I have chosen to undertake this study in a rather unorthodox manner, using a mixture of personal experience as well as empirical data to explore creativity. It is very much my belief that reality, life experience and concreteness are invaluable and necessary to the investigation of such a complex phenomenon and that such a methodology can be an extremely powerful approach.
Chapter 2. Background

2.1 My Background

I am an artist first and foremost, well actually I am a human being, first and foremost, but somehow I think they are the same thing. Let me explain. I believe that as human beings we are inherently creative. As children we are creating all the time, which would seem to indicate that this is part of our human nature (Robinson, 2007). It is in our basic make up to want to explore, experiment, play and create (Elkind, 2007; Winnicott, 1971). As an artist I like to explore different domains. I enjoy the experience of being ‘in a foreign land’. This thesis is a story of my journey in many ‘foreign lands’ (domains) as well as my familiar turf, to try to uncover some of the mysteries of the creative process.

One of the most interesting and important aspects that I have learnt when I started to write journal papers and this PhD thesis is that my experiences are important. They are important for so many reasons. Apart from the fact that some of these experiences are interesting to other people, they also inform. My experiences, and yours, are unique and therefore fascinating. That is what makes our world and us so colourful, so multifaceted. So let me give some background about myself, as I believe that understanding the context from which a person is coming from can often give the reader a richer understanding of the context from which the subject is being written.

I was born in a little country town in Australia to a very mixed heritage, with some wonderful and slightly challenging twists and turns. My mother and father separated when I was about 18 months old. My father disappeared to a remote part of Australia, not to reappear for many years later. My mother, who had a very rudimentary education and had basically married to escape her family life, was left with two small children and very few resources. My mother, who was originally from New Zealand, returned with my brother and I, to her home country, possibly hoping for some support, which was not forthcoming. My mother then proceeded to work in whatever jobs she could, in order to provide for her small family.
When it came to providing for the family, she did fairly well, considering the little she had to work with. She cleaned houses, worked in factories and did whatever else she could to make ends meet. We lived in a housing commission house in Porirua, Wellington, which was quite a tough area. But she kept the house clean, warm and for a while, relatively safe. My mother’s one real downfall was her choice of partners. These choices ended up making life rather colourful and slightly dangerous at times.

One night when I was about 9 years old, I was woken up in the middle of the night, being told that we were leaving. And leave we did. We could only take what we could carry and then we were on a plane to Australia. Apart from the excitement of taking a plane and getting to stay in the ‘People’s Palace’ (which I thought was a rather fancy hotel but found out later was very much not) it was quite a shock to leave one’s home and country in such a sudden way. It did however, teach me a great deal and gave me quite a number of important insights later on in my life.

So a new country, a new life! It was on to the next interesting chapter, which led us to the wonderful and rather challenging Australian bush. And I loved it there. The ingredients were sadly very similar to previous circumstances - little resources, unpleasant people, a splash of danger and a smidge of neglect. But the one thing that made this new experience bearable was nature and the chance to escape to it. This, I think kept me strong and reasonably healthy. I also remember having some of my first greatest insights in wonderfully still, natural spaces, where it was just nature and I, ‘having a chat’.

I loved living in the country even though in some ways it was even more dangerous than the city. But I never had a fear of nature, only the nature of mankind. I had a healthy respect for the natural elements and wildlife, which is required in such a place as the Australian bush, but that was much easier to understand and accept than the erratic, incredibly destructive aspects of human beings.
It was also in this new setting that I discovered books. The worlds of Charles Darwin, Shakespeare, Dickens and many more wonderful beings opened up my world. I managed to remain in this nurturing, safe environment for a few years before bureaucracy, ignorance and stupidity stepped into this sacred environment. So, torn from my wonderful haven of peace, learnedness and serenity I was sent to live with my father who I had not seen for most of my childhood, in Far North Queensland. Of course this brilliant decision made by the governmental ‘powers over lost children’ was rather disastrous. Again nature came to my rescue. Many, many hours were spent walking on beaches and communing with nature. When I would sit on the beach staring out at the ocean, all seemed well with the world. The craziness, stupidity and lack of coherence that was apparent in human nature had luckily not seemed to spill over into the intelligence, harmony and coherence that was nature itself.

Again a lucky break came and I was sent to boarding school. A place to learn in peace – relatively- as a girls-only boarding school was not exactly the epitome of peaceful interactions. But it was safe and there were books. There was also another element I had not experienced before and that was God. I had not been exposed to such a concept up until this point and the idea of a greater, wiser being out there seemed to be a rather intriguing idea.

So as I learnt my ‘three r’s and a bit’. I also informed myself about this idea of a God. The idea of a greater source than what we merely see around us, really fired up my imagination. It also seemed to make perfect sense from my experiences of nature – after all, the perfection and intelligence that I had come to discover in nature were to me some of the most wise and deeply intelligent things I had ever witnessed and experienced. I went on to study more about the concept of God from many different cultures. I also studied humanity a little deeper by completing a Psychology degree and working with children and families much like my own had been, after I left school. In 1993 I decided it was time to move away from the constant immersion into dysfunctional humanity and start to create something beautiful.
I moved to Singapore and started my career as an artist. I continued to delve into spirituality of different cultures. It was at a Buddhist temple that I learnt about meditation and yoga. I became very intrigued about how similar the experiences were between meditation and when I painted. I explored this further when I started painting with Chinese ink, as there was a very strong link between the use of this medium as an expression of one's 'state of being'. The brush strokes were reflective not only of movement but also of pauses, hesitation, strength of pressure placed on the paper. Chinese ink almost seems to be a wonderful external expression of the physiological elements of the person painting. Perhaps this is why this medium was encouraged in the Zen monasteries and seen as a useful tool for understanding one's self.

My relationship with nature and a deep respect for the intelligence of nature has also remained with me. I must also confess to a certain propensity to question the norms of society. I have been very blessed to be able to travel to many countries and experience many different cultures, which also provided me with the opportunity to see that there are a multitude of ways to view the world and to live in it. This diversity of experience, I believe, has led me to this point where I am asking some serious questions about how we function and whether or not we are following a ‘natural, intelligence’ or whether we are actually forcing ourselves into a way of life almost devoid of our natural tendencies and creativity.

2.2 Self Study as an artist

I started my career as an artist in 1993 in Singapore where I held my first Solo exhibition in 1996 and have exhibited internationally since then. My work can be found in private collections around the world.
Here are a few examples of my work from my earliest to my latest:

Figure 1: *Flow*. Oil on canvas. 80 x 100 cm

Figure 2: *Surrender*. Clay. 12 cm
Figure 3. Untitled. Chinese Ink on Paper 60 x 80 cm

Figure 4. The Dancers. Oil on canvas. 100 x 120 cm
As I mentioned earlier the creative process became fascinating to me when I realised that there were some similarities between my meditative state and my ‘creative state’. I started to record my creative process in 1995 by journaling, to try to gain a greater insight into what was happening in that process. This was the beginning of my study of creativity.

I tend to agree with creativity researchers who say that studying something as complex as creativity, one requires a multi-dimensional approach (Feldman, 1999; Plucker, 2011). A uni-dimensional approach is simply inadequate if it is to be an effective form of researching creativity (Sternberg & Lubart, 1999). Creativity has been studied in a multitude of ways, one of the most prevalent, being the qualitative case study approach (Policastro and Gardner, 1999; Csikszentmihalyi, 1996). The case study methodology consists of recording or observing the process of exceptionally creative people in different fields.

Observation and interviews are carried out by the researchers and have already provided a wealth of insight into the creative process (Sternberg, 1999).
The insight that could be gained by adding the extra dimension of self-reflection within the creative process has the potential to make a very important contribution to creativity research. Bullogh and Pinnegar (2004) talk about the continuous and communal nature of self-study. This continuous nature of self-study may be a very useful methodology that can allow one to observe an on-going movement or interplay of a process. This is why self-study is an important methodology for studying something as multifaceted, interrelated and dynamic as creativity. And that is why I chose the self-study methodology as my entrance point to studying creativity.

Up until this point there have been very few formal self studies carried out in the area of creativity. One of the reasons may have been that self-study has only recently become accepted as a valid, acceptable form of research (Connelly and Clandinin, 1990). There have also been very few published accounts of a subjective reflection of the creative process. Poincaré (1952) is probably one of the most famous examples of a person reflecting upon their own creative process and sharing his insights to a greater audience. His reflections inspired Wallas (1926) to write about the creative process. Wallas’ theory of the creative process was one of the first formal models of the creative process and is still used to this very day.

I began my self-study in 1995 by writing down my observations of the factors that were coming into play and were important in my creative process. I recorded my self-reflections of the process as I was experiencing it, through journaling. Often discussions with others related to the field, were either recorded using voice memo or written down after the conversation. I also wrote down my observations of children and adults as they journeyed through their own creative process. Over the years a pattern seemed to emerge from the myriad of factors and conditions that seemed to be a part of the creative process. From my observations, I came to the insight that there may be three potentially deeper sources of creativity. These are state of being; interaction with the environment and a dynamic temporal and spatial movement of experience that feeds into the creative process. What then became interesting to me was to see if other creativity researchers had also come up with similar insights.
Before we go on I think it is important to define the terms of ‘state of being’ and ‘dynamic movement’ and creativity as they are key to this research and will be used extensively throughout this thesis. It is important to point out a comment that was made when I first presented my PhD to a group of interested researchers. One of the researchers, who is a very senior philosopher asked me extensively about these terms that I was using. This was an extremely valuable exercise, as was the point that he made, that if these terms were not well defined then everything that I was trying to say would end up being nonsensical. This of course made me extremely nervous and worried but it also made me want to ensure that these terms were defined in a substantial and relevant manner. The next section of this thesis aims at defining terms: ‘state of being’, ‘dynamic movement’ and creativity that are in my research question.
Chapter 3  Defining terms

3.1  ‘State of Being’

In thinking about how to effectively define this term I thought maybe the best way to start was to see what was already out in the world at large. So, I decided to start with a general Google search of ‘State of Being’ as I felt this would give an indication of what is accepted generally at this time. I was given the following responses from that search;

1. ‘state of being’ - WordReference Forums

“I understand the phrase. < > However, I’m trying to translate it. So, could anyone give a better definition or alternative phrasing that would make ...”

In this post the authors are trying to translate ‘state of being’ from English to Italian, and this is what they come up with:

*I picked up the idea from various philosophy lessons that all of one’s qualities, conditions, attributes, personality, etc can be generalised as their ‘States of Being.’ I’m compiling a very detailed vocabulary of typical ‘states of being’ both to improve my english vocab and to methodically learn my italian vocab.*

*The Italian responses recommended stato di esistenza (state of existence) and/or stato d’essere (state of being) which appears to mesh with all the input supplied here and with what I had originally thought it could be, so I can now stop obsessing!! Yea!!* (Italian Junkie, 2006)

2. Definition of state of being

This was more of a standard, brief translation of the term ‘state of being’ that is focusing more on the physical state:
**state of being**

**noun**

- As opposed to mental condition (state of mind), the overall physical condition of a person.

**adjective**

- Regarding a person's physical condition. (state of being, 2012)

3. Flow (psychology) - Wikipedia, the free encyclopedia

*The further from the center an experience is, the greater the intensity of that state of being* (whether it is flow or anxiety or boredom or relaxation).

It was interesting to see Mihalyi Cziksentmihalyi’s concept of flow turning up in the context of ‘state of being’. This was a rather long article that introduced some interesting concepts that are related to ‘state of being’ and flow, where he talks about a person entering into different states, such as a ‘state of absorption’.

(Wikipedia, April 2012)

3. The ‘State of Being’ is not a state of ’having been’ or ’will become’.

This article was based more on Eastern philosophy and states that:

*“The State of Being is not a state of 'having been' or 'will become.' Atman, the Self, the Soul, is not a 'has been' or 'want-a-be'. Your Real Self is not what you think you were in the past, or want to be in the future—nor is it what you think you are now. You are what you ARE, and what is that? That is the pure state of 'is-ness', the pure State of Being. “*

(The State of Being, 2012)

4. State of being - Releasing Your Unlimited Creativity

This website was talking about ‘state of being’ in relation to creativity and had some very interesting points:
“Intellectually, as state of being would be defined as a way of thinking and functioning in the world with a set of definable characteristics that can be used to distinguish one state of being from another. This understanding of a state of being makes us think that a state of being lies inside us. For example, thinking is a state of being characterized by thinking. Laughing can be a state of being. Play is a state of being such that in which we are engaged is not seen as important to our mind.

Although this understanding of a state of being is sufficient from most uses of the phrase ‘state of being’, from the creativity perspective, the state of being is something a little different. As a result of how our inner world is reflected in the outer, whatever state we are in is also being expressed as our environment, what our bodies are doing in that environment and the experience we are having in our bodies in that environment.” (Ferlic, 2008)

These are some interesting ‘lay person’s’ interpretations of ‘state of being’. When I then went to Google Scholar to see what the Academic community makes of this term, this is what appears:

   ... practices: • principles: • essences: what you do guiding ideas and insights the state of being of those with high levels of mastery in the discipline. ... Senge believes that it is just such a state of being that organizational members experience as a natural part of work. (Senge, 1993)

In this chapter Senge is talking about the ‘state of being’ of an individual and an organisation in regard to creating a shared vision. ‘State of being’ seems to him to be about the personality, attitude and approach a person or organisation takes for particular goals or modes of achievement.
The term ‘state of being’ did not really appear as a very common or easily defined term in the Google Scholar search. It was interesting just to look at the articles that did appear on the first page, as most of the articles were brought up because of the word state and were not particularly relevant to gauging an insight into what the academic community defined ‘state of being’ as - at least as reflected in Google scholar. What is interesting from the articles that appeared, is that there seemed to be an inherent acceptance of the term of ‘state of being’ and it was used in most of the articles as a universally accepted term that did not require definition.

I then thought it might be interesting to check the Google scholar for a ‘state of being’ definition. And this is what appeared:

1. A quantitative approach to the World Health Organization definition of health: physical, mental and social well-being

   ... A quantitative approach to the World Health Organization definition of health: physical, mental and social well-being. Int. J. Epid. 1972, 1: 347-355. ... Ideas of so-called positive health emerged, i.e. a state of being not just disease-free but of wellness beyond the norm. (Breslow, 1972)

2. Toward a Uniform Definition of Wellness: A Commentary.

   ... Abstract: This report proposes a uniform definition of wellness that refers to wellness as a multidimensional state of being, describing the existence of positive health in an individual as exemplified by quality of life and a sense of wellbeing. ...(Corbin and Pangrazi, 2001)

Of course there were many more sites suggested from this search but the overall trend was that a ‘state of being’ was somehow linked to well being and seen as a particular state that one is in. This is a very general use of the term so perhaps it would be useful to try to come up with a clearer definition for ‘state of being’ for the purpose of this research.
Being and ‘state of being’ have been discussed since pre Socratic times. St Thomas Aquinas talks about substance as being real or not. He says that what makes an individual substance – a man, or a tree - real is a distinct act i.e. a ‘to be’, which actuates its unity as an individual substance (Kreyche, 1959). This seems like a rather abstract concept of being but the idea of unity, I believe, is a very important one, as it seems to sum up a very fundamental element of our existence, that of defining ourselves as a unified entity. St Thomas Aquinas seemed to be alluding to this idea of striving to define oneself by the act of being, which may manifest itself in being in an external world. What he may have been asserting is that by acting on the external environment, one gets a sense of oneself. Another way of defining oneself may also be acting internally, reflecting upon oneself as a being that has had or is having specific experiences. Winnicott (1971) touched on this in his theory of transitional phenomena and play.

Being is also understood as one's ‘state of being’ and its common meaning is in the context of personal experience, with aspects that involve expressions and manifestations coming from an innate ‘being’, or personal character. Heidegger coined the term ‘dasein’ for this property of being in which each of us, is him/herself. He argued that being or ‘dasein’ links one's sense of one's body to one's perception of the world (Heidegger, 2010). In one of the studies I conducted in this research series, I asked a group of children to describe ‘cohesiveness’ and they described it as “being calm, relaxed, going slowly and carefully.” They seemed to have a sense of the ‘state of being’ of a cohesive person by the way they were physically moving in their environment and what mood they seemed to be in (Deininger, 2012).

Within the psychology circles this concept of ‘state of being’ is not static, but is viewed as man in two states; both Being and Becoming, both actuality and potentiality (Maslow, 1962). Maslow talks about a self–actualising person as having a coherent personality syndrome and representing optimal psychological health and functioning, which includes self-acceptance, autonomy, and profound interpersonal relations.
Moreover, he argued that self-actualization refers not only to the qualities of self-acknowledgement in a person but also to the qualities of relationships a person has with the world.

Recently psychological states have started to be measured via physiological signatures. Damasio (2003) sums up this relationship between the physiological and psychological aspects of a person very well:

“The feelings we experience as ‘negative’ are indicative of body states in which life processes struggle for balance and can even be chaotically out of control. By contrast, the feelings we experience as ‘positive’ actually reflect body states in which the regulation of life processes becomes efficient, or even optimal, free-flowing and easy” (pp. 131).

These emotive and mental states seem to generate and transmit different rhythms and patterns of physiological activity which are then being used to ascertain adult and foetal well being (McCraty et.al, 2009; Romano et. al, 2005). These patterns and rhythms could then be a way of measuring a person’s ‘state of being’. The idea of coherence is a very important aspect that has been used in some of this research, as a quantitative measure, in particular Heart Rate Variability. Heart Rate Variability (HRV) coherence is a coherent pattern as characterized by a regular, sine-wave-like form. Coherence also shows up as a qualitative concept as cohesiveness, openness and mental stillness.

From the many different sources, common online discussions, ancient Eastern philosophy to St Thomas Aquinas, we can start to see some common elements start to bubble to the surface of what ‘state of being’ may be. Firstly, ‘state of being’ appears to be more than just the mental state or condition. The emotional and physical condition of a person is seen as an important aspect to a person’s ‘state of being’ also. Therefore the definition I will be using for ‘state of being’ is: the emotional, mental and physical condition of a person. For this research series the ‘state of being’ will be measured through rhythms and patterns of physiological activity, self-reflection and personal reports.
3.2 ‘Dynamic Movement’

Bergson (1911) argued that we must allow space for free will to unfold in an autonomous and unpredictable fashion. He talked about an unceasing variation of every physical state that has an impact on an individual at an intuitive level. Bergson defines intuition as an experience of sorts, which connects us to things themselves (Bergson, 1934/1946). He gives an example of a city reconstructed with juxtaposed photographs taken from every viewpoint and angle. Bergson says that the reconstruction can never give us the dimensional value of walking through the actual city itself. This can only ever be grasped through a simple intuition.

Intuition can also be linked to the concept of personal experience. This occurs when intuition is also seen as a sort of sympathy which Bergson points out in ‘The Creative Mind’. For Bergson, sympathy consists of putting ourselves in the place of others. Bergsonian intuition then consists of entering a thing, rather than going around it from the outside. This “entering into,” for Bergson, gives us absolute knowledge (Lawlor, et.al, 2012). But perhaps it is more an empathy than sympathy. This element of experience impacting an individual has reappeared in contemporary theories on mind put forward by Noé (2009) and Clark (1998, 2008).

“Biological brains are first and foremost the control systems for biological bodies. Biological bodies move and act in rich real-world surroundings” (Clark, 1998. pp.506). Contemporary embodied cognition theorists have categorized this personal experience into two areas, on-line and off-line embodied cognition. On-line cognitive activity is seen as task relevant, the mind can be seen as operating to serve the needs of a body interacting with a real-world situation (Wilson, 2002). “Off-line aspects of embodied cognition, include cognitive activities in which sensory and motor resources are brought to bear on mental tasks whose referents are distant in time and space or are altogether imaginary. In these cases, rather than the mind operating to serve the body, we find the body (or its control systems) serving the mind” (Wilson, 2002. pp.635).
Either way the body, brain and experience are feeding into an individual’s overall understanding of the world.

Winnicott (1971) also talked about this relationship between an individual and the environment as being imperative for the healthy development of an individual. He also discusses the external environment as being a cultural experience, which is separate from an individual but also made up of “a common pool of humanity, into which individuals and groups of people may contribute, and from which we may all draw if we have somewhere to put what we find” (p.133). Winnicott talks of cultural experience as being the potential space between the individual and the environment.

David Bohm suggests that this movement of interacting with the environment is in a constant state of process or becoming. For Bohm, wholeness is not a static oneness, but a dynamic wholeness-in-motion in which everything moves together in an interconnected process (Bohm, 1980. pp.11).

The nature of this movement that Bergson, Clark, Winnicott and Bohm speak of could be described as spontaneous. The term ‘spontaneous’ is described in dictionary.com as:

“coming or resulting from a natural impulse or tendency; without effort or premeditation; natural and unconstrained; unplanned: e.g: a spontaneous burst of applause” (spontaneaous, 2012a)

or as

“having an open, natural, and uninhibited manner. Biology (of movement or activity in an organism) instinctive or involuntary: the spontaneous mechanical activity of circular smooth muscle. Archaic (of a plant) growing naturally and without being tended or cultivated. (spontaneous, 2012b)
So not only is the movement of interacting with the environment dynamic but also natural and instinct driven, which is what Bergson says when describing intuition as a way of knowing our world.

Taking into account these different theories of an individual’s continuous dynamic interaction with the environment, the definition of the term spontaneous and the nature of the interplay with the environment, I have developed a working definition of dynamic movement that I will be using in relation to this research.

The definition I will be using for ‘dynamic movement’ is: a continuous motion of personal experience that is of a spontaneous and non-linear nature. I have included the term non linear in this definition as I wished to give more information about the direction and nature of the dynamic aspect of the movement. The non-linear aspect also links to this concept of the spontaneous aspect of this movement, in that it is not predictable nor is it a lineal, causative response necessarily.

3.3 Definition of creativity

Creativity theories are diverse, complex and many! This is due to the many different perspectives and contexts in which this phenomenon occurs. Because of this complexity and diversity it is important but incredibly difficult to have an agreed upon definition. Overall there does appear to be an agreement on a broad definition of creativity across disciplines that are currently investigating creativity. "Creativity is the ability to produce work that is both novel and appropriate" (Sternberg and Lubart, 1999). Sternberg and Kaufman (2010) rephrased this definition recently to define creativity under two categories: novelty and quality. That is to say: "Creative work is original and somehow distinctive with respect to the work with which it is compared. The second element: quality, refers to the judgement from a reference group that the work is not merely novel, but also good, or perhaps even useful, according to that reference group" (Sternberg and Kaufman, 2010. pp.467). This very general definition appears to be a good working definition that is used in the many areas that creativity is being explored (Plucker, 2010).
This rewording of the definition in 2010 appears to be taking into account the issue of domains and fields that Csikszentmihalyi introduced in 1996 in his major work, *Flow*. Although these are incredibly important aspects of creativity, they seem to not include the personal aspect of creativity. Boden (2004) categorizes creativity into Historical (HC) and Psychological creativity (PC) which she states:

“P-creativity involves coming up with a surprising, valuable idea that’s new to the person who comes up with it. It doesn't matter how many people have had that idea before. Whereas if a new idea is H-creative, that means that (so far as we know) no-one else has had it before: it has arisen for the first time in human history.” (pp.1)

I think this qualification of ‘P’ and ‘H’ creativity is important to keep in mind when defining Creativity. Boden’s definition encompasses both kinds of creativity; “Creativity is the ability to come up with ideas or artefacts that are new, surprising, and valuable.” (p.1) She suggests that creativity enters into virtually every aspect of life. She asserts that creativity is grounded in everyday abilities such as conceptual thinking, perception, memory, and reflective self-criticism. This element of being grounded in everyday abilities is what I would call substantive, as creativity also has the qualities of being important, meaningful, and/or considerable.

There are a multitude of definitions of creativity, depending on domains, perspectives and disciplines that are being investigated in regard to this phenomenon. But for the purpose of this research a more general definition is required. Taking into account the multitude of different views of creativity and also wanting to include both the psychological or personal view as well as the historical view, I would therefore define creativity as ‘the ability to come up with ideas or artefacts that are novel, valuable and substantive within a psychological or historical context’.
3.4 Language and the style of this thesis

I found myself learning a new language when I began this research degree - one that I called "academic speak" which I found more and more prevalent, the more I was exposed to publications and academic dialogue. Just as in any discipline there are ways of phrasing, and a vocabulary that is specific to it. I also found as I read more and more academic articles that there appeared to also be cultural differences in the way that they were written. For instance a native German speaker was more likely to be very precise and use particularly technical terminology that is accurate but rather dry. As someone who has learnt German, I came to understand that this might be because of the way that German is spoken. It tends to be a very precise language that requires precise terminology to convey a message accurately. Just as an aside, perhaps the different styles of English that non-native speakers use, would be an interesting area of study to pursue by linguists and experts dealing with communication. This would perhaps be a good time to study this, as our world becomes more of a global village and English seems to be the village language.

I found myself also approaching this new language in a similar way to the way that I had approached learning German. As I am also a poet, I enjoy playing with language and I found myself doing this with 'academic speak'. As with German, as is possibly the case for anyone speaking a new language, I noticed that my (perhaps not very good) use of the language also challenged the people who have been speaking this language for many years. They reported that they sometimes needed to rephrase and reflect upon how they communicate, when speaking to a 'non-native' speaker. I found myself questioning whether this language-'academic speak'- as with many others, was being used thoughtlessly and perhaps even unnecessarily keeping people who were not in the academic world, out of the 'circle of knowledge', simply by making it too hard to understand.
I realized personally that I did not wish to be someone that was so proficient at ‘academic speak’ that the ‘person on the street’ could no longer understand me. It was then that I made a conscious decision to keep my language simple in how I convey my findings. On this theme I was also inspired by something that the great Physicist Richard Feynman said in a BBC interview (1981) and was reiterated again by his colleague in a tribute to Feynman in 2011 (Susskind 2011). Feynman asserted that someone who truly knew what they were talking about is able to explain even a very complex concept well and in simple terms, so that anyone can understand. This is why I have chosen to write this thesis in ‘common person’s language’ so that these findings are (hopefully) accessible to all.
Chapter 4  Overview of thesis

4.1  Research aims and objectives.

This research is based on three main factors: my 15-year self study as a practising artist, an analysis of contemporary creativity and mind theories and empirically testing key propositions that arise from these explorations.

In analysing my own insights as a practising artist, this concept of a deeper and wider source of creativity started to surface. From my subjective experience as an artist, I came to the insight that there may be three key potential areas of inquiry. These are: state of being, interaction with the environment and a dynamic temporal and spatial movement within the creative process. Similar concepts were introduced by Bohm and Peat (1987), Bohm (1996) and Peat (2000) but have not been subject to empirical investigation.

The main aim of this research is to study subjective, personal experience in order to establish whether ‘state of being’ and ‘dynamic movement’ have a relationship to creativity. Subjective experience has been recorded using self-reports, interviews, observations and physiological responses. Definitions for the terms ‘state of being’ and ‘dynamic movement’ will have also been established.

The objectives of this research are:

1. To identify key propositions of the creative process based on my 15 year self-study
2. To analyse my 15 year self study and compare those findings to contemporary creativity and mind theories.
3. Design qualitative and quantitative studies to investigate these key propositions.
4.2 Structure and outline of this thesis.

The research question being asked in this thesis is: Does ‘State of Being’ and ‘Dynamic Movement’ have a relationship with creativity? ‘State of Being’ has been defined as: the emotional, mental and physical condition of a person. ‘Dynamic Movement’ has been defined as: a continuous motion of personal experience that is of a spontaneous and non-linear nature. Creativity has been defined as the ability to come up with ideas or artefacts that are novel, valuable and substantive within a psychological or historical context.

A background setting for how this research question developed has so far been presented in the first part of this thesis; giving my background experience, my rationale for undertaking this research, a brief introduction to my self-study and defining the key terms of this research question.

An outline of historical and contemporary theories will be presented in the following chapter, with particular emphasis on what I call ‘the fathers of creativity theory and their sons’, looking at Henri Bergson, Graham Wallas, Mihaly Csikszentmihalyi, David Bohm and David Peat. The history of creativity research will be briefly talked about as a setting for the following chapter, which will be looking at contemporary creativity and mind theories. There will also be a section in the chapter on embodied cognition that will be looking at play and the role it has in the area of the mind and human development.

These first few chapters have set the scene and develop a context upon which to begin exploring creativity in the context of ‘state of being’ and ‘dynamic movement’. The way that I investigate these propositions will then be explained in the methodology section, which will give both an overall methodology as well as specific methodologies employed by the individual studies. This research covers a number of different contexts in which these key propositions are investigated empirically.
The reason for the diversity of studies and approaches is that such an approach has the capacity to be a more powerful indicator of the relationship being explored, than if we would just investigate the relationship in one particular setting or in one particular way.

In the methodology, results and discussion chapters, studies are dealt with predominantly as independent individual studies. The findings of these individual studies are then synthesised in the discussion chapter and commonalities are highlighted. Once this synthesis has been explained, the next chapter details how such findings can then be applied in a practical sense in business, education, research and personal contexts.

In the conclusion I will return to the original aims and objectives first introduced in the beginning of the thesis to explore whether these have been met. In the conclusion I will also point out the contribution to knowledge that has been made. I reflect on the impact the findings from these studies have upon the key theories put forward by the ‘fathers and sons’ of creativity theory. At the end of this thesis I will point out areas of possible further investigation, as well as daring to dream a little.
Chapter 5  Contemporary creativity and mind theories

5.1  History of creativity theory

An overall historical perspective of creativity is an important starting point in understanding what has already been explored and established in this field. The very earliest accounts of creativity were based on mystique and concepts of divine intervention (Sternberg and Lubart, 1999). The concept of creativity coming from divinity has taken a back seat for a considerable amount of time, it does however sometimes make an appearance in the field of creativity research; "the greatest advances continue to inspire awe and appear born from mystical or divine sources." This statement was made in an article that was written in the last few years about neurobiological aspects of creativity, which just goes to show that the element of mystique is still associated with creativity (Kaufman, et.al, 2010).

From as far back as the 1900’s however, another commonly accepted source of creativity has been the mind. In looking at creativity one cannot wander far from also wanting to understand the mind. Henri Bergson and Graham Wallas are what I call the ‘father’s of creativity theory’ as they incorporated creativity into their theory of the mind. Creativity played an important role in their theories of mind and was often referred to in their musings about the mind and how it works. I believe that the modern ‘sons of creativity’ who have had an important impact on creativity theory also are Mihaly Csikszentmihalyi in his monumental study of highly creative people. David Bohm and David Peat also seem to have taken the legacy that Henri Bergson left and expanded upon the idea of creativity as being part of an intrinsic movement of the cosmos. In this next section I will give a brief overview of the theories put forward by Bergson, Wallas, Csikszentmihalyi, Bohm and Peat.
5.1.1. The fathers of creativity and their sons

Henri Bergson

Henri Bergson was a philosopher whose intellectual career was from the 1880s to the 1930s. He provided a rigorous account of the real efficacy of time (which he called duration). This allowed him to conceive of creativity as the source of both psychological freedom and of life as an open system (Vaughan, 2007). In Bergson’s philosophy, as outlined in The Creative Mind (1946) he talks about two kinds of mental activities: intellect and intuition. He states that these provide two different kinds of knowledge: intellect provides relative knowledge and intuition provides absolute knowledge. Bergson also talks about time as falling into two categories, the flow of time only being able to be experienced by intuition. Intellect tries to break time down into units that he then states can lead to a false perception of reality as the intellect substitutes discontinuity for continuity. In some ways Jill Bolte-Taylor wonderfully illustrates Bergson’s idea of the mind as having this dual functionality, when she describes her experiences whilst she was having a stroke. She would slip in and out of this continuous, unified element of perception and then try to function using unitary constructs such as telephone numbers (Bolte-Taylor, 2008).

Some of Bergson's other philosophical concepts include Élan vital, or the living, creative force that he saw as driving evolution and also as showing up in mankind's impulse to create. Bergson attempted to redefine the relations between science and metaphysics, intelligence and intuition, and insisted on the necessity of increasing an understanding of the mind through the use of intuition, which, Bergson believed was the only way of having knowledge of the absolute and of real life. He described this understanding of the absolute as duration.

Duration, as defined by Bergson, is a unity and a multiplicity, but, because it is ever moving and changing, it cannot be grasped through immobile concepts. Bergson argues that one can only experience duration through his method of intuition.
Bergson gives an exercise to illustrate what he means by the term intuition. The first image is that of a city. Analysis, or the creation of concepts through different points of view, can only ever give us a model of the city through a construction of photographs that are taken from every possible point of view. But this can never give us the dimensional value of walking in the city itself. One can only grasp this through intuition. What Bergson seems to be saying is that in order for human intelligence to gain true knowledge of the essence of life, it will have to proceed by means of a mode of knowing that lies at the opposite end of intelligence.

Bergson shows that our habitual way of knowing, based on needs, is the only obstacle to knowledge of the absolute. He argues that this obstacle consists in the idea of disorder. All theories of knowledge have in one way or another been asking a rather traditional question of “why is there order rather than disorder?” This question seems to stem from the assumption that the mind is able to create order mysteriously out of chaos. But, for Bergson, it is not a matter of order versus disorder, but rather of one order in relation to another. According to Bergson, the real obeys a certain kind of organization, namely, that of the qualitative multiplicity. Structured around its needs and interests, our intelligence fails to recognize this ultimate reality. These ideas seem to be later reflected in theories put forth by Bohm and Peat (1987).

Bergson is always specific when talking about creativity as a separate mental function from the overall functioning of the mind. But in looking at his description of mental functioning, creativity would seem to fall more in the realm of intuition than of intellect. This is not to say creativity comes purely from intuition but in looking at the description of intuition which is of a continuous, flowing nature that is very much connected with continuous real life experiences, this is closer to how creativity was later described (Csikszentmihalyi, 1996; Bohm and Peat, 1987). Bergson does concede that the two forms of knowledge, intuition and intellect, can be integrated to produce a unified knowledge of reality.
I believe Bergson was very important in introducing this idea of the continuous nature of reality as perceived through intuition. His concept of intuition and experience as informing us of a deeper understanding of our world are concepts that we see appear in descriptions of the creative process, as reported by a number of well-known creative people, such as Einstein, Picasso and Stravinsky (Gardner, 1993). Bergson’s description of time is also very similar to the way that many creative people describe their perception of time when talking about their creative process (Csikszentmihalyi, 1996, Gardner, 1993, von Müller, 2010).

**Graham Wallas**

Graham Wallas was an English socialist, social psychologist, educationalist, a leader of the Fabian Society and co-founder of the London School of Economics in 1895. He had a passion for the investigation of human nature. At the time that Wallas introduced his theory of creativity, a systematic study of the creative process was relatively new. In his work *Art of Thought*, published in 1926, Wallas presented one of the first models of the creative process, which was based mainly upon insights reported by Poincaré. In this model, creative insights and illuminations were explained as a process consisting of 5 stages; Preparation - Incubation – Intimation - Illumination - Verification. Here is a brief explanation of these 5 stages.

1) Preparation - preparatory work on a problem that focuses the individual’s mind on the problem and explores the problem’s dimensions;

2) Incubation - where the problem is internalized into the unconscious mind and nothing appears externally to be happening;

3) Intimation - the creative person gets a 'feeling' that a solution is on its way;

4) Illumination or insight - where the creative idea bursts forth from its preconscious processing into conscious awareness;
5) Verification - where the idea is consciously verified, elaborated, and then applied.

This model is still used as one of the most accepted stage models of creativity. What is interesting is that Wallas seems to have included what Bergson would call the two elements of mind: intellect and intuition. The intellect would be evident in the preparation and verification stages and the intuition would be evident in the incubation, intimation and illumination stages.

The introduction of the unconscious mind as playing an important role in the creative process has been controversial ever since Wallas introduced it. This element of the unconscious is a difficult phenomenon to measure and perhaps that is why very few researchers have tried to investigate it. The construct of the unconscious has been predominantly found in the philosophical and psychoanalytic circles. However, cognitive researchers have started to “reveal that automatically, and clearly outside of conscious awareness, individuals register and acquire more information than what they often experience through their conscious thoughts” (Augusto, 2010).

This again reflects what Bergson was saying in the 1900’s and would possibly explain why incubation is such an important element of creativity. What exactly goes on in the unconscious mind is still very much being debated. But what is important is the concept that the unconscious mind plays a crucially important role in the creative process. This idea has been widely accepted since Wallas proposed it in 1926 and still is to this day.

**Mihaly Csikszentmihalyi**

Mihaly Csikszentmihalyi is a Hungarian psychology professor who immigrated to the United States at the age of 22. When Csikszentmihalyi was 16 he went to Switzerland where he heard Carl Jung speak.
He talks about how this experience had a great impact on his life: “As a child in the war I’d seen something drastically wrong with how adults - the grown-ups I trusted - organized their thinking. I was trying to find a better system to order my life. Jung seemed to be trying to cope with some of the more positive aspects of human experience” (Csikszentmihalyi, 2004). According to Csikszentmihalyi creativity results from the interaction of a system consisting of three elements: a culture that contains symbolic rules; a person who brings novelty into the symbolic domain; and a field of experts who recognize and validate the innovation.

He uses the definition of creativity that states that creativity is the process by which a symbolic domain in the culture is changed. In looking at Csikszentmihalyi’s theory of creativity, it is very important to keep in mind that this is the definition he uses. He is not talking about personal or psychological creativity unless it falls into the category of making a symbolic change in a domain.

He does recognise that people experience the world in novel and original ways and that these individuals’ perceptions may be fresh, and insightful. He also acknowledges that they may even make important discoveries. Csikszentmihalyi calls such people ‘personally creative’ but this form of creativity is not included in his overall theory of creativity. He refers to it again only when talking about flow.

**The Domain:** Csikszentmihalyi talks about each domain as having its own symbolic elements, rules and system of notation or language. In many ways, each domain is an isolated little world in which a person can think and act with clarity and concentration because of this specific language and symbols. An example of a domain could be the world of mathematics that would also consist of more specific domains such as applied mathematics or pure mathematics.

Csikszentmihalyi asserts that domains create order that was not programmed into our genes by biological evolution therefore he believes domains themselves are an excellent example of human creativity.
Csikszentmihalyi believes it is impossible to be creative without having first internalized a domain or culture, based on the definition he is using. He asserts that a person must believe in the importance of such a domain in order to learn its rules. Therefore a person cannot be creative without being both traditional and conservative as he or she has adhered to the rules of the specific domain but they must also be rebellious at the same time. Being only traditional leaves the domain unchanged, and just being reckless without fully understanding a domain and taking too many chances, may not really end up as a worthwhile creative act.

**The Field:** Csikszentmihalyi says that a field is necessary to determine the worth of a new idea. It is his assertion that no culture can assimilate all the novelty people produce without dissolving into chaos. A culture must include individuals who act as ‘gatekeepers’ for a domain. The gatekeepers are the one’s who have been sanctioned to decide whether a new idea or product can be accepted. It is only when the gatekeepers have agreed that the contribution is acceptable within the domain that it can be accepted as an act of creativity.

This definition and context of domains and fields is quite a limited view of creativity and allows for only a very specific aspect of creativity, which is mainly in the social realm. ‘Leaps of insight’ across domains or fields do not appear to be catered for in this theory. Where Csikszentmihalyi does seem to make a more universal contribution to creativity theory is in his observations of the ‘creative personality’ and his ‘flow’ theory.

**Creative Personality**

Csikszentmihalyi says that what makes creative people different from others is complexity. Creative personalities show tendencies of thought and action that in most people are segregated, according to his research. Having a complex personality means being able to express the full range of traits that are potentially present in the human repertoire, but usually not present because we tend to judge one extreme as good, and another extreme as being bad.
According to Csikszentmihalyi creative individuals have a great deal of physical energy. They can work long hours, with great concentration, while often projecting a sense of freshness and enthusiasm. The energy of creative individuals appears to be internally generated and seems due more to their focused minds than to the superiority of their genes. This does not mean creative people are hyperactive. In fact, they often take rests and sleep a lot. But when they are working, they are extremely focused. They seem to follow a rhythm of activity followed by idleness or reflection that seems very important for the success of their work. Creative individuals tend to be open and sensitive. Perhaps the most important quality of creative individuals is their ability to enjoy the process of creation for its own sake.

**Enhancing Personal Creativity**

Having said that there are people who have creative personalities Csikszentmihalyi goes on to say that each person has, potentially, all the psychic energy needed to lead a creative life. Csikszentmihalyi asserts that personality is nothing more than a habitual way of thinking, feeling, and acting, that it is more or less a unique pattern by which we use psychic energy or attention. Thus based on this definition of personality he says that changing personality simply means learning new patterns of attention, at looking at different things, and looking at them in a different way. There may well be a number of psychologists that disagree with this definition of personality.

Csikszentmihalyi points out that there are many obstacles that prevent people from expressing their creative potential. The following are the obstacles he says that stand in the way of each person reaching their creative personality:

Some people are just too exhausted by too many demands, and so have trouble activating their psychic energy. Others get easily distracted and find it difficult to protect and channel whatever energy they have.
He points out that in terms of using mental energy creatively, perhaps the most fundamental element is in how much uncommitted attention people have left over from the everyday to deal with novelty. He believes that when survival needs require all of one’s attention, none is left over for being creative. This however does not take into account the incredible capacity for human beings to be creative due to necessity or having ‘their back to the wall’ (as my Marine Sergeant points out later in this thesis.)

One must also remain open and focused at the same time in order to tap into their creative potential. Csikszentmihalyi says that before we have discovered an overriding interest in a particular domain, it makes sense to be open as much as possible. After one has developed an interest, however, Csikszentmihalyi asserts that it may make more sense to divert all the energy into that one domain. This does however rule out the wonderful benefit of being open to many diverse interests, which may then feed into the creative process. There is also the risk of leading one to becoming too myopic and therefore no longer having the capacity to make unusual connections. He does however later point out that it is very important to shift often from openness to closure. He says that perhaps the most important duality that creative persons need to be able to integrate, is being open and receptive on the one hand, and focused and hard-driving on the other.

**The Creative Process**

Csikszentmihalyi also describes the Creative Process, which appears to be very similar to Wallas’ creative stages model. He says that there are five elements to the creative process, the first three are almost identical to Wallas’ model, and the last two are a little different and would probably fall under Wallas’ verification stage. These are:

- **Preparation** - becoming immersed in problematic issues that are interesting and arouses curiosity.
- **Incubation** - ideas churn around below the threshold of consciousness.
- **Insight** - the “Aha!” moment when the puzzle starts to fall together.
- **Evaluation** - deciding if the insight is valuable and worth pursuing.
- **Elaboration** - translating the insight into its final work.
  
  (Csikszentmihalyi, 1996, pp.79)

It is interesting that the second phase, incubation- during which ideas churn around below the threshold of consciousness - is said to be one of the most creative elements of the entire process. According to Csikszentmihalyi, it is during this time that unusual connections are likely to be made. What happens in this ‘dark, unknown’ space defies ordinary analysis and evokes the original mystery shrouding the work of genius. This idea of a mysterious space that is below the conscious mind, reminds me of Bergson and his emphasis on intuition as being the purveyor of absolute knowledge, which would perhaps explain how unusual connections are made.

**Flow**

Creative persons differ from one another in a variety of ways, but in one respect they are the same. According to Csikszentmihalyi, they love what they do. They also seem to enter into a particular state that Csikszentmihalyi calls ‘flow’.

The flow experience has the following criteria:

- *There are clear goals every step of the way*
- *There is immediate feedback to one’s actions*
- *There is a balance between challenges and skills*
- *Action and awareness are merged*
- *Distractions are excluded from consciousness*
- *There is no worry of failure*
- *Self-consciousness disappears*
- *The sense of time becomes distorted*
- *The activity becomes autotelic.* (Csikszentmihalyi, 1996. pp. 111 -113.)
According to Csikszentmihalyi focus and concentration hold the key to achieving flow. Distraction interrupts flow and it may take hours to recover the peace of mind one needs to get on with the work. To achieve a flow state, a balance must be struck between the challenge of the task and the skill of the performer. It is after we get out of flow, at the end of a session or in moments of distraction within it, that we might feel a rush of well being, of satisfaction that comes when the work is completed.

Some of the aspects described by Csikszentmihalyi in his flow concept remind me of play. The immediate feedback to one’s actions often occurs in play, especially physical play. In order for play to be enjoyable there needs to be a balance between challenge and skill. When children in particular are playing, action and awareness are often merged and distractions are excluded from consciousness. One of the key factors of play is that there is no worry of failure and self-consciousness disappears, as does one’s sense of time often (Gordon, 2008; Liebemann, 1988).

**Bohm and Peat’s theory of creativity**

Bohm was a quantum physicist who was interested in how the world worked both on a micro and macro scale. He proposed a new order that he called implicate order (Bohm, 1980). An order that almost seemed to be demanded because of the revolutions brought about by quantum theory and relativity theory. This new order was quite different to what has currently been accepted in the scientific circles but Bohm believed that this new order would bring us closer to the way we actually perceive and experience the world.

Bohm contended that the Cartesian order of space and time kept a person as an observer and not as a participator of the universe. Bohm was clear that unless there was a new order of space and time then there could be no reconciliation between relativity and quantum theory. He was describing an order that was not reductionistic, where processes within the orders below could give rise to manifestations at higher orders. These higher orders then condition those that lie below (Bohm and Peat, 1987).
Bohm's call for a new order was not just meant for the scientific community. What was very important about his approach is that in this new scientific revolution the world was seen as whole and a process. He was really looking at a "theory of everything", matter, process, space, time and even consciousness (Bohm and Peat, 2010). For Bohm a new order was also a new order and understanding of creativity. It would be a new order of mind and matter and what lies beyond. They would all be ways of expressing our participation in the on-going processes of creation and renewal. Bohm approached this new order from the perspective of the sciences by asking questions about the structure of space and time, of the meaning of matter, light and energy, of moving from object to process. He and David Peat also started to ask about this process in the area of creativity that very much belongs to many different realms.

David Peat has a tremendous knowledge of the arts as well as being a quantum physicist. Peat believes that there are important questions being explored within the arts that have many parallels with what is going on in science. Peat has spent many years exploring artists and sculptors looking at art as an expression of the natural, of matter and the human body. He points out that sculpture is often about entering into the space within the body and using that as the starting point (2000). According to Peat, sculpture is about seeking ways to define space in relationship to the human body and the architecture in which it lives - a space within and a space without. Therefore space becomes a relationship, a relationship based within the sensation of the body. This relationship would seem to be very similar to what Bohm was exploring in his new theory.

In seeking a new order, Bohm saw that it was very much involved in the reality of the material world and his existence within it. Peat gives a good example of Bohm’s idea that mind and matter were indivisible. Peat points out that it is not so much the brain that is thinking, but the entire body is ‘thinking’ through subtle muscular movements that then unfold into thoughts.
The body movements become ordered, or that an internal body process takes place that can then partly manifest itself in intuitions and perceptions (Bohm and Peat, 2010). Using the language of Implicate order, Bohm and Peat assert that the whole lays implicit in each part and is therefore present in an implicate way within one’s body and the world at large. This idea is quite reminiscent of Bergson’s concept of intuition and how intuition perceives through an on-going interaction with the world and is on-going and ever moving.

Creativity then becomes an expression of nature. According to Peat, the scientist and artist almost become the co-workers of nature. Nature is then no longer divorced from the creative process but inherently the master artist that seeks new ways to express herself through human society. When a person engages in a creative act, transformation occurs both at the level of perception and material realization, one that cannot be explained in mechanistic terms alone according to Peat and Bohm. Creativity then becomes more than an act of expression or a production of something original and novel. It is then also a movement; “a real movement that is actually going on, both inwardly and outwardly, with real effects of widespread and deep significance that interpenetrate and merge with the whole of reality in which we live” (Bohm, 1996. pp.80). Bohm and Peat were looking at the interplay between the individual, within themselves, and their interaction with the environment. It seems that they were interested in how creativity evolved from that movement in space and time. Rather than looking at creativity from a microscopic view listing the multitude of different factors that appear to be contributing to this phenomenon, they were proposing a broader, universal perspective and movement.

This broad, universal perspective entailed looking at the movement of the facets, rather than just the facets themselves. From observing this movement they started to see one important element that could be a potential ‘starting point’ for the ‘dance of creativity’. They proposed that the movement of creativity started with the 'state of mind' of the person. Bohm (1996) went on to further describe this state of mind as being
"one whose interest in what is being done is wholehearted and total, like that of a young child. With this spirit, it is always open to learning what is new, to perceiving new differences and new similarities, leading to new orders and structures in the field of what is seen" (Bohm 1996. pp.21).

This emphasis on an open ‘state of mind’ and how important one’s interaction with the world shows up to some extent in Bergson, Wallas and Csikszentmihalyi’s theories of creativity as well. Bergson refers to intuition as being of a continuous, flowing nature where one should dilate or enlarge and is being immersed in the world. Wallas proposes that the incubation stage is where one is stepping out of the conscious mind and opening oneself to the unconscious and therefore no longer mentally focusing on the issue. He also talks of a person having an intimation that something is coming before reaching inspiration; this could be similar to Peat’s idea of having a body sensation that is part of the thinking process. Csikszentmihalyi talks of a creative person as being open and sensitive. He also talks of the importance of the world at large with a particular emphasis on fields and domains.

5.1.2 History of creativity research

Within the psychoanalysis circles creativity was explored in terms of the conscious, the unconscious and mass consciousness as early as the 1930s (Gardner, 1993; Jung, 1933; Winnicott, 1971). There have been some very valuable personal insights gleaned from this perspective, which are still very relevant today. Gestalt therapists began looking at the phenomena of insight in the 1960s, but much of this type of exploration was abandoned in favour of the more empirical approach of psychometric testing in the 1980s (Mayer, 1999; Runco, 2010).

Creativity research from the 1950s has been dominated by psychometric testing mainly because theories can be empirically tested using these methods. However many of the psychometric tests are still being debated for their efficacy as a true measure of creativity (Plucker, 2010).
This seems to be mainly due to the multifaceted nature of creativity. Wehner et.al (1991) give the analogy of the study of creativity being similar to blind people touching an elephant at different places of it's body, and thinking that they have a complete understanding of the whole animal. There are a multitude of different aspects and domains that appear to be relevant to creativity, hence it is very difficult to capture or measure this phenomenon through singular psychometric means. As Kozbelt (2010) points out this:

"important to emphasize pluralism, whereby a multitude of theoretical perspectives, with different assumptions and methods, and operating at different levels of analysis, all (ideally) contribute to a more robust - if at times, contestable - understanding of human creativity." (pp.20)

In the field of psychology creativity appears to be an incredibly multi-faceted phenomenon. So what happens if we move to a more scientific field and look at creativity research in that context? The two main physiological research areas that are looking at creativity are: cognitive neuroscience and cognitive neurogenetics. Creativity has been widely accepted as a cognitive event and cognition has predominantly been seen as being biologically grounded (Kaufmann, 2010).

In this area there appears to be less of a volume of theories of creativity, the two main theories being that 1. Creative cognition lies predominantly in the right hemisphere of the brain and 2. That creative cognition is derived from a reduction in network inhibition that is mainly in the frontal lobe (Allen, J, 2009). The fact that there are only a few new theories about creativity in this field, may not be because they are all encompassing, adequate theories for creative cognition, but simply due to the fact that this field of study is quite new and has only recently come about (Dietrich, 2004).

Incredible advances in modern brain measurement capabilities have led to an increase in the amount of research in this area but it is still a relatively new field that is exploring creativity (Dietrich 2004).
There appears to be the same sort of trend in creativity research in neurophysiology as there was in the psychology field of the 1950s, where researcher’s are focusing more and more on specific aspects of creativity and steering away from the big picture. What is being discovered, which is consistent with the findings from other disciplines looking at creativity, is that creativity is an incredibly complex phenomenon that does not seem to fall easily into one unified element of functioning.

5.3 Contemporary theories of creativity

The variability of this topic and the contexts in which it is being explored are huge - from quiet private musings of a normal individual to the greatest achievements of human genius throughout our history. The variation is compounded by the fact that creativity involves a multitude of conceptualisations, domains, disciplines, empirical methods, levels of analysis, and research orientations (Kozbelt et.al. 2010).

A basic categorisation of creativity theory proposed by Kozbelt et. al (2010) is metaphorical versus scientific. They are not necessarily mutually exclusive and are perhaps just a bottom up versus a top down approach. But this does seem to be the beginning of a dualistic tension that is evident in looking at many of the contemporary theories of creativity. Although these two perspectives are not mutually exclusive, in the literature, there does seem to be a preference for one or the other approach (Bohm and Peat, 1987, Kaufman and Sternberg, 2010). By favouring an objective approach, specific and valuable elements may be overlooked. A more subjective approach is often difficult to test or to make valid generalisations. Focusing on either of these approaches solely, would lead to only a partial view of creativity. But let’s have a brief look at what is currently out there in the field of contemporary creativity theories.
Rhodes (1961) suggested the four ‘p’s’ of creativity: process, product, person or place. This model of creativity was also recently expanded and now has five p’s, the new ‘p’ being ‘persuasion’, with possibly more to come (Kozbelt et al., 2010). It was also recently suggested that these categories be further organised into a hierarchy that sorts the creativity theories into creative performances versus creative potentials (Runco, 2008).

What seems to be emerging here regarding understanding creativity are ever more categories, contexts, parameters, and elements. This multitude of facets of creativity increases even more when looked at in different fields of discipline: developmental, psychometric, economic, stage and componential process, cognitive, problem solving and expertise based, problem finding, evolutionary, typological, neurophysiological, system theories and the list goes on. It starts to become very clear that not only do "creativity scholars have much more work ahead of them" (Kozbelt et al. 2010) but the more complex the categorising of creativity becomes, the less likely we are of coming to a universal, coherent understanding of this phenomenon.

If we look from a psychoanalytic perspective, creativity is said to well up from unconscious drives (Runco and Pritzker. 1999). Freud, as the founding father of psychoanalysis had the first say on creativity in this realm. He took a pathological view of the creative process where imagination and fantasy were experienced because of conflicts stemming from wish fulfilment and biological drives (Freud, 1958). The idea that creativity comes from drives is touched on by many psychologists and is an important element to keep in mind.

Carl Jung (1933) talks of this drive almost as though it can be independent of the artist. He asserts that the creative act shapes the artist as the work unfolds.
“The creative process has a feminine quality, and the creative work arises from unconscious depths—we might say, from the realm of the mothers. Whenever the creative force predominates, human life is ruled and molded by the unconscious as against the active will, and the conscious ego is swept along on a subterranean current, being nothing more than a helpless observer of events. The work in process becomes the poet’s fate and determines his psychic development” (pp.174).

Maslow (1963) touches upon the idea that creativity helps to form a healthy, self-actualizing human being. I think one of the most important contributions of the humanistic psychologists to creativity is the idea that creativity is essential for the growth of individuals as he/she learns, adapts and develops an inner sense of self. Maslow describes creativity as having three categories: primary creativity, secondary creativity, and integrated creativity. The first category describes creativity that comes from the primary processes; he includes cognitive processes in addition to the ‘Dionysian drives of the id’. Secondary creativity results from the use of higher thought processes; it is Apollonian. It takes over the creative process from primary creativity and includes analysis, discipline and effort. Secondary creativity dominates during the verification stage (Wallas, 1926); it may also be the main process during Wallas’ preparation stage. His final category is integrated creativity. This category fuses primary and secondary creativity: it is the source of the great works of art, philosophy, and scientific discoveries. Maslow asserts that this creative integration is also a characteristic found very often in the lives of self-actualized, healthy human beings.

I have only touched on a small sampling of some of the contemporary creativity theories that predominate in this field. It may be useful at this point to introduce an analogy to illustrate a possible new direction in looking at creativity. Let’s begin by calling this vast area of study a forest - the "creativity forest".
In that forest we have very dedicated ‘foresters’ (scientists and scholars) who are very diligently trying to understand their particular tree. (Perhaps a few are gifted enough to look at two or three trees at the same time!) We are going to turn these relatively myopic, landlocked ‘foresters’ into winged creatures. At first they are mainly fixated on their one tree and are unable to get a true sense of the creativity forest, no matter how hard they study their tree. So, let’s encourage them to take flight and have them fly quite a distance from their trees.

What may then happen, because they are looking from a distance and a very new perspective, is that they are able to see the forest for the trees. What then would they be seeing? Well, perhaps they would start to see that some of the trees are not all that vastly different, such as the many different theories of creativity, which are pointing out similar concepts but using different terminology (Kozbelt 2010). They would also possibly start to see that the forest is made up of more than just trees; there are animals (such as humour, play, tools and experiences) that also commonly make up the forest (Lieberman, 1977; Csikszentmihalyi, 1996; Ziv, 1976). If they continue to observe the creativity forest they may well start to get a greater understanding of the ecological relationship that enables that forest to survive and thrive. They would possibly start to see that the forest could only exist because it is actually a living ecological system that is dynamic and thrives through the interplay of the surrounding environment. They may well start to develop a more dynamic, unified perspective of creativity.

This idea of a dynamic, unified perspective of creativity is something Bohm and Peat (1987) were touching upon in their proposed theory of the generative order of creativity. This dynamic aspect of creativity was suggested to be “a real movement that is actually going on, both inwardly and outwardly, with real effects of widespread and deep significance that interpenetrate and merge with the whole of reality in which we live” (Bohm, 1996. 80). What Bohm and Peat were looking at in a metaphorical sense was the interplay between the individual, within themselves, and their interaction with the environment. They were interested in how creativity evolved from that movement in space and time. Rather than looking at creativity from a microscopic view listing the multitude of different factors that appear to be
contributing to this phenomenon, they were proposing a broader, universal perspective and movement.

This broad, universal perspective entailed looking at the movement of the facets, rather than just the facets themselves. From observing this movement Bohm and Peat proposed a pattern or order that seemed to be arising. This pattern they called the ‘generative order’ of creativity. One important element that they discovered in their exploration of creativity from this universal perspective was a proposed starting point for the movement of creativity. They proposed that the movement of creativity started with the 'state of mind' of the person. Bohm (1996) went on to further describe this state of mind as being open and almost childlike, which leads to perceiving new connections, which in turn can lead to new structures in a field. He proposed that this state of mind was imperative for the movement of creativity to occur.

Kozbelt.et.al (2010) points out a "golden mean" of creativity would be an extremely ambitious undertaking and one that would require empirical support as well as a sound metaphorical grounding. Bohm and Peat had definitely begun to develop a strong metaphorical foundation for such a theory. What is required now is the empirical support for such a universal theory. One area of investigation may be to look at this 'state of mind' that Bohm talks about. Another way of providing empirical support may be to investigate how a person interacts with their external environment and how that may lead to new perceptions and perhaps creating and learning, new orders and new structures.

5.4. Theories of embodied cognition

5.4.1 History of embodied mind theories

In philosophy, the embodied mind theory holds that the nature of the human mind is inextricably linked to the human body. Human reason is inextricably tied to our bodies and the peculiarities of our brains.
According to Lakoff and Johnson our bodies, brains, and interactions with our environment provide the mostly unconscious basis for our sense of what is real (Lakoff and Johnson, 1980). Philosophers, psychologists, cognitive scientists, and artificial intelligence researchers who study embodied cognition and the embodied mind argue that all aspects of cognition assert that the body's interactions with the environment and the ontological assumptions about the world are built into the body and the brain.

George Lakoff and his collaborators have written a series of books promoting and expanding the thesis based on discoveries in cognitive science, in the context of linguistics and metaphor. They have started to give evidence that suggest that people use their understanding of familiar physical objects, actions and situations to understand other more complex domains (such as mathematics or relationships). Lakoff argues that all cognition is based on knowledge that comes from the body and that other domains are mapped onto our embodied knowledge using a combination of conceptual metaphor, image schema and prototypes (Lakoff and Johnson, 1980). Lakoff and Johnson showed that humans use metaphors constantly and that metaphors operate at a conceptual level. According to Lakoff and Johnson, metaphors involve an unlimited number of individual expressions and that the same metaphor is used conventionally throughout a culture.

Robotics researchers have argued that machines that have sensory and motor skills can only achieve true artificial intelligence. They have asserted that these machines must be connected to the world through the body in order to function as any kind of replica of human intelligence (Brooks, 1999). The insights from such robotics researchers have in turn inspired philosophers like Andy Clark and Alva Noë. Artificial intelligence research from about the 1980s simulated intelligence using logic and high-level abstract symbols. This approach ran into serious difficulties, as researchers discovered that abstract, disembodied reasoning was highly inefficient and was not achieving human-like levels of competence on even simple tasks.
But recently AI research has achieved success by using "embodied" approaches; that is, by directly simulating the functions we associate with the body (such as perception and motion) without using logic or any abstract symbolism. The results of recent AI research have provided more evidence in support of embodied mind theories (Clark, 2008).

Another source of inspiration for embodiment theory has been research in cognitive neurosciences. Neuroscientists such as Antonio Damasio have outlined the connection between the body, individual structures in the brain and aspects of the mind such as consciousness, emotion and self-awareness (Damasio, 2003). Embodied cognition theories have given emotions a new status in philosophy of mind as indispensable, rather than a non-essential addition to rational intellectual thought.

Wilson (2002) sums up the current views of embodied cognition very well in her “Six Views of Embodied Cognition”. These six views are:

1. **Cognition is situated.** Cognitive activity takes place in the context of a real-world environment, and inherently involves perception and action.
2. **Cognition is time-pressured.** We are 'mind on the hoof' (Clark, 1997), and cognition must be understood in terms of how it functions under the pressure of real-time interaction with the environment.
3. **We off-load cognitive work onto the environment.** Because of limits on our information-processing abilities (e.g., limits on attention and working memory), we exploit the environment to reduce the cognitive workload. We make the environment hold or even manipulate information for us, and we harvest that information only on a need-to-know basis.
4. **The environment is part of the cognitive system.** The information flow between mind and world is so dense and continuous that, for scientists studying the nature of cognitive activity, the mind alone is not a meaningful unit of analysis.
5. **Cognition is for action.** The function of the mind is to guide action and things such as perception and memory must be understood in terms of their contribution to situation-appropriate behavior.
6. **Off-line cognition is body-based.** Even when decoupled from the environment, the activity of the mind is grounded in mechanisms that evolved for interaction with the environment- that is, mechanisms of sensory processing and motor control.” (pp. 626)

### 5.4.2 Embodied Cognition theories and creativity

In the 1950s and 60s research of creativity and insight came to be dominated by an information-processing approach, linked to developments in Artificial Intelligence (Mayer, 1999). According to this view, creativity was a product of the mind caused by the neural processes of the brain. More recently, however, considerable debate has been generated about the precise location of the mind, and whether it is instantiated in the brain (Noë, 2009; Clark, 2008; Pepperell, 2003; Hameroff, 2007). The implications of so-called 'extended' or 'enactive' theories of mind are potentially important for topics like creativity, as they introduce the idea of an interplay between the brain, body and environment. These approaches seem to be pointing to a deeper and wider source of creativity and the location of mind as being more than just the brain-centred model that has dominated for so long.

Bohm and Peat (1987) talk about play and interaction with the environment as being important aspects of creativity. The idea of interaction with the world at large having an impact on cognitive activities is also being proposed in contemporary theories of the mind. Merleau-Ponty argued that perception and representation always occur in the context of, and are structured, in the course of a person's on-going purposeful engagement with the world (Anderson, 2003). Embodied cognitive scientists are proposing that cognition deeply depends on the involvement of the body in sensing and acting as well as being neurally instantiated. The first aspect of embodied cognition examines the role of the physical body, particularly how its properties affect its ability to think. Vision and depth perception are better explained by embodied cognition due to the sheer complexity of these phenomena (Noe, 2009; Clark, 1998).
The second aspect of embodied cognition is that humans use metaphors whenever possible to better explain their external world. These metaphors are often of a physical, bodily nature. Therefore it would seem that mental representation is affected by bodily experience rather than the other way around (Lakoff and Johnson, 2003). A third component of the embodied cognition looks at how people use their immediate environment in cognitive processing. It is suggested that the local environment is seen as an actual extension of the body's cognitive processes. This is sometimes referred to as the extended mind theory (Clark, 2008).

Wilson (2002) explains embodied Cognition as being situated i.e. cognitive activity takes place in the context of a real-world environment, and involves perception and action. It is also in real time. Therefore the production of cognitive activity does not come from mind alone, but rather is a mixture of the mind and the environmental situation that we are in and these interactions become part of our cognitive systems. Our thinking and decision-making are all impacted by our environmental situation.

Thelen and Smith (1994) offered a challenge to cognitive developmental theorists by applying a dynamical systems theory to developmental psychology. One very important aspect of this dynamical systems theory is that it can generate novel behaviours through bodily activity. This would reflect what Bohm (1996) was proposing when he talked about the importance of interaction with the environment for creativity. Thelen and Smith were also proposing that there was an aspect of development that was emergent and self-organising, based more on physical experience than on cognitive problem solving and learning, which was something that Bohm and Peat (1986) had been suggesting in their generative order theory.

Embodied cognition also seems to be appearing more in the area of art theory and practise. "For instance Hockney (David) talked about his reflective process in which; he asks and makes theories only after, and not before, having done something" (Sullivan, 2011. pp.117). This element of first experiencing physically

3 author's word.
and then developing a cognitive representation in the area of art making would appear to support the theory of embodied cognition as part the creative process.

5.4.3 What about play?

If embodied cognition is a way of ‘thinking’ then what does that make play? Could one then say that play was also a form of thinking? Play is often defined as being a spontaneous activity that is joyful, having the absence of consequences and the removal of constraint (Guildford, 1959; Liebemann, 1988). This is a clear and simple definition but it may not take into account all the nuances that play can have and fails to include the role of the environment. Gwen Gordon (2008) attempts to give a more thorough, universal definition of play:

“Play is the voluntary movement across boundaries, opening with total absorption into a highly flexible field, releasing tension in ways that are pleasurable, exposing players to the unexpected, and making transformation possible. Transformations occur as frames bisociate and the parts and the whole interpenetrate, increasing the differentiation of the part, the integration of the whole, and the range, coordination, and spontaneity of movement between and among them.” (pp.12)

This is a very thorough but rather cumbersome definition of play. It brings in important elements of movement that occurs in play and that play appears to have an affect upon our well-being. But it fails to address the role of the interaction with the environment and frankly it is just too abstract.

Winnicott has an interesting perspective of play. He starts setting the scene; that is to say talking about the ‘playground’. His work predominantly came from his observations of the mother and baby and he uses these experiences to describe his concepts on play. He states that a baby’s confidence in the mother is the first playground that people experience. “The playground is a potential space between the mother and the baby, joining mother and baby” (1971, pp.64).
Once this space has been established then play can begin. He describes play as being precarious because of “the interplay of personal psychic reality and the experience of control of actual objects.” (pp.64). Winnicott introduces an interesting concept of cultural space that he describes as being located between the individual and the environment. He goes on to say that this cultural experience “begins with creative living first manifested in play” (pp.135).

I believe Winnicott is touching on an incredibly important aspect of play that to date seems to have been ignored or dismissed and that is, that play is essential to the individual developing a relationship not only to oneself but also to the environment. This relationship of experiencing is as important as the ‘inner relationship’.

“the third part of life of a human being, a part that we cannot ignore, is an intermediate area of experiencing, to which inner reality and external life both contribute” (1971, pp.3)

The concepts that Winnicott introduces regarding play are in line with the theories of embodied cognition, in that the interaction with the external environment are seen as having a crucial role in the development of a human being. I am not sure Winnicott would agree with the extended mind aspects of embodied cognition as he often emphasizes the importance of the ‘me’ and the ‘not me’. He does however, highlight the importance of the individual and the relationship the individual has with the world at large as being imperative to healthy development. In his theories of transitional objects and transitional phenomenon he describes the act of playing as being one of the first activities of a human being.

Therefore we start to see play as being more than a pleasurable pastime and actually being an enormously important aspect of our development. Play would appear to be one of the first instinctual activities that we choose to engage in when we enter this world. Play, it would appear, is one of the first and perhaps most natural ways that we engage in our world.
It may be that play is also one of the most prevalent examples of embodied cognition in action, not to mention an incredibly important aspect of development as healthy human beings and possibly creativity. (Winnicott, 1971; Gordon and Esbjörn-Hargens, 2007; Sutton-Smith, 1966).

5.5 A summary

This chapter has looked at the history of creativity and mind theories, contemporary creativity and mind theories and the possibility that play could also be an important aspect of embodied cognition and creativity. Henri Bergson, David Bohm and David Peat offered the broadest universal understanding of creativity. Bergson was held in great esteem within the Philosophical circles of his time and his theories have had a great influence on philosophy in general. His contribution to the understanding of creativity was part of his philosophy of understanding the mind and universal knowledge. David Bohm and David Peat were also exploring creativity in terms of a universal understanding of our world. These two great scientists were also interested in the natural and intrinsic movement and order that the creative process seemed to reflect. Graham Wallas proposed a process model for creativity and perhaps the creative stage that could be seen as applying to a more universal perspective would be his incubation stage, which is slightly reminiscent of Bergson’s intuition concept.

All of these great thinkers based most of their theories on personal experience and anecdotal knowledge. Csikszentmihalyi’s contribution to a universal understanding of creativity seems to be two main factors. The first assertion that all those creative people he studied had one thing in common and that was that they loved what they were doing. The second contribution is the concept of flow, which also has some similar elements to Bergson, Bohm and Peat, in which he talks about a state of being.

The contemporary creativity theorists seemed to have been heavily influenced by psychometrics, which by its very nature is not inclined to take a universal approach, due to the difficulty of creating a valid measurement for such a broad phenomenon. Therefore, if we return to the earlier analogy of the creativity forest,
they seem to have contented themselves with understanding the trees or a cluster of trees, possibly in the hope that a deeper understanding of these specifics may lead to a broader understanding in the long run. But as Kozbelt and his colleagues point out creativity scholars still have a great deal of work ahead of them if they are to continue to adopt such an approach (Kozbelt, 2010).

The emergence of the recent debate of the situatedness of the mind is also very important in investigating creativity because creativity has been universally accepted as a function of the mind (Boden, 2004). Embodied cognition theorists such as Clark, Noë and Wilson have started to introduce the idea that the body and not only the brain play an extremely important role in functions of the mind, based on evidence predominantly from AI. Bergson, Bohm and Peat as well as artists have also reported that the element of physical interaction with the world at large is an inherent and crucially important element of the creative process.

Play has also recently started to enter this field of debate about the embodied mind, learning and creativity. Gwen Gordon has started to explore play at a much deeper level, delving into our fundamental nature and sometimes also reflecting some of the assertions of Bergson (1946). Winnicott had introduced the fundamental importance of play as an act of creativity based upon his observations of babies as well as his experiences in his psychotherapy practise. What seems to be emerging from these theorists willing to take a broader more universal perspective is that creativity is actually something that is fundamental to our nature, our state of being as well as our interaction with the world at large. Some of these theories are based upon empirical evidence such as Csikszentmihalyi, Winnicott, Clark and Gordon but a great deal of these theories have not yet been explored on a more empirical, practical level, especially in a variety of different contexts. The next three chapters of this thesis will outline my empirical exploration into the key aspects that have emerged from the literature as well as my self-study, using a number of different methodologies and contexts.
Chapter 6  Methodology

6.1 Overview

This doctoral work is made up of a number of smaller studies rather than one large study; therefore there is an overall methodology that ties the research series together and different, specific methodologies employed for the different individual studies.

The idea of this series of studies was to investigate whether there was a relationship between ‘state of being’ and ‘dynamic movement’ with creativity. The relationship was to be investigated both qualitatively and quantitatively. In research, there often seems to be a dualistic tension between a subjective, qualitative approach and an objective quantitative approach. Although these two perspectives are not mutually exclusive, there tends to be a preference for one or the other in the scientific circles (Bohm and Peat, 1987). By favouring an objective approach, specific, valuable elements may be overlooked. A more subjective approach is often difficult to test or to make valid generalisations. Focusing on either of these approaches solely, leads to only a partial view of creativity.

In the 1950’s Campbell and Fiske set out to try to rectify this battle between the subjective and objective. They proposed a multi-trait method matrix in which qualitative and quantitative methods could be viewed as complementary rather than as rival camps (Campbell and Fiske; 1955, 1959). Their proposal was developed further and is now often referred to as the Triangulation method, whereby combinations of methodologies are employed to study the same phenomenon (Denzin, 1978). The triangulation methodology is ideal for studying such a complex phenomenon as creativity, as one requires a multi-dimensional approach rather than a uni-dimensional one (Feldman, 1999; Plucker, 2011).
The advantages of a multi method approach are that it;
“can also capture a more complete, holistic, and contextual portrayal of the
unit(s) under study. That is, beyond the analysis of overlapping
variance, the use of multiple measures may also uncover
some unique variance which otherwise may have
been neglected by single methods. It is here that qualitative
methods, in particular, can play an especially prominent role
by eliciting data and suggesting conclusions to which other
methods would be blind. Elements of the context are illuminated.
In this sense, triangulation may be used not only to
examine the same phenomenon from multiple perspectives
but also to enrich our understanding by allowing for new or
deeper dimensions to emerge” (Jicks, 1979. pp.602)

Therefore the Triangulation method seems to be an extremely appropriate method
to employ in this investigation. Also, this approach allows for a certain degree of
creativity, which Bohm strongly advocates when one is studying the subject of
creativity and one that I have very much applied to this series of studies. I felt that
it was important that I approach this research in the same way that I approached
my art, as that is when I am my most creative. What has been interesting is how
this body of work has unfolded. The process felt very similar to my approach to my
artwork. The whole body of work began with my personal experience as an artist. I
was personally motivated to understand the creative process, as it did not seem to
be a straightforward, linear process. There appeared to be a much deeper and
sophisticated source underlying the creative act.

I started recording my personal observations from 1995. This then led to the idea
of testing some of the insights I had gained from my personal observations. This
was firstly done in the creative workshops, play and prototyping workshops and
the cohesive classroom studies.
These studies then led to asking about the ‘state of being’ of participants, which led to the first HRV study. The creative workshops and the cohesive classroom study also created an interest in the role of play in creativity, which then led to the play and creative problem solving studies. The HRV study led to a more in-depth look at coherent states and creativity. The cohesive classroom study led to the Modal preference study. And all of these studies are leading to a research area looking at play and state of being which I will talk about more in the ‘further research’ section of this thesis. These studies did not unfold in a particular sequence but followed more closely a dynamic movement.

The qualitative studies conducted for this PhD consisted of a narrative self study, personal reports from participants of the different studies, action research, workshops and diaries. The results were then analysed, interpreted and compared. The quantitative approach consisted of physiological measurements, divergent thinking and Consensual Assessment Technique measures (Amabile, 1982), numerical performance results and statistical analysis of differences in performance in different conditions.

6.1.1 Ethics approval
Ethical approval was granted for the research conducted for this PhD. The research fell under either “Deliberate Play” for Adults or “Cohesive Classroom” for children.

6.2 Qualitative Studies

6.2.1 A Fascinating Journey - Methodology

Self study - effective method for studying creativity?
To date, narrative self-study has been used within educational settings predominantly. What has been shown in that context is that this form of research provides a greater depth and understanding of everyday practices (Loughran, 2007; Pinnegar and Hamilton, 2009).
Narrative self-study is a methodology whereby the researcher has a personal stake in what is being researched, which seems to add another dimension to the level of inquiry and integrity of the research (Pinnegar and Hamilton, 2009).

Up until this point creativity has been studied in a multitude of ways, one of the most prevalent, being the qualitative case study approach (Policastro and Gardner 1999; Csikszentmihalyi 1996). These studies consisted of recording the reported process of exceptionally creative people in different fields. Observation and interviews as case studies, within creativity research have already provided a wealth of insight into the creative process (Sternberg, 1999). The insight that could be gained by adding the extra dimension of self-reflection within the creative process has the potential to make a very important contribution to creativity research. Bullogh and Pinnegar (2004) talk about the continuous and communal nature of self-study. This continuous nature of self-study is what is required in order to be able to observe an on-going movement or interplay of a process. This is why narrative self-study is an important methodology for studying something as multifaceted and dynamic as creativity.

Over the last 15 years working as an artist, I was fascinated with the creative process that I was experiencing and therefore began a self-study of my own creative process in my painting and poetry. I recorded my experiences in a number of journals, recording my reflections and experiences of my art as I worked on different pieces. What I also decided to do was to record my creative process when I started the PhD research series, as I was interested in whether or not the creative process would be different in a different context. As I was thinking about how best to research creativity it had become increasingly clear that fundamentally this research must be approached with creativity!
As Bohm (1996) states, "creative work requires, above all, a creative state of mind" (pp.12).

Bohm defines a creative state of mind as being
"one whose interest in what is being done is wholehearted and total, like that of a young child. With this spirit, it is always open to learning what is new, to perceiving new differences and new similarities, leading to new orders and structures in the field of what is seen." (Bohm 1996. pp.21).

In the field of Psychology this playful, open and passionate attitude towards a subject are commonly found to be the fundamental prerequisites for creative insights or acts (Aldous, 2007; Sternberg, 1999; Csikszentmihalyi, 1996).

It was this approach of open, creative, playfulness that I decided to adopt when undertaking the research degree. As I began recording my approach, it seemed almost as if the PhD was another art piece and it struck me that perhaps this creative process I had known in my artwork was present in other areas outside of the artistic realms. So I then began comparing the information that I had gathered over the years regarding the creative process, in relation to my art, to the process that was unfolding as I approached my PhD research.

I gathered data by writing down my observations of the factors that were coming into play and were important in my creative process. I recorded my self-reflections of the process as I was experiencing it, through journaling. Often discussions with others, related to the field, were either recorded using voice memo or written down after the conversation. This type of data collection is in line with the guidelines for a sound and valid narrative self-study (Bullogh and Pinnegar, 2001). The data collected during the production of my artwork is far more extensive as it has been gathered over more than fifteen years. The data from the PhD has been gathered over the last two years.

I then compared my findings of the last two years, as an academic researcher, with what I had recorded, as an artist, over the last fifteen years.
6.2.2 Cohesive Classroom – an action research methodology.

This was an action research study undertaken in a private school in Munich, Germany. An action research methodology is based upon the structure first introduced by Lewin in 1946;

“The first step is to examine the idea carefully in the light of the means available. Frequently more fact-finding about the situation is required. If this first period of planning is successful, two items emerge: namely, “an overall plan” of how to reach the objective and secondly, a decision in regard to the first step of action. Usually this planning has also somewhat modified the original idea.

The next step is ‘composed of a circle of planning, executing, and reconnaissance or fact finding for the purpose of evaluating the results of the second step, and preparing the rational basis for planning the third step, and for perhaps modifying again the overall plan.” (1946, pp. 37)

This study focused on a third year Primary class (children 8 - 9 years old), a class teacher and a teacher's assistant.

The study was started in March, 2011 and was aimed at identifying the factors that affect cohesiveness in a classroom setting. The children understood cohesiveness in this context as behaving in a calm, concentrated manner. This particular class was chosen due to the fact that there had been on-going problems with how the class members were interacting with one another and the teachers. The children were exhibiting difficult behaviours in transitioning between lessons, in their interaction with one another and poor, irresponsible behaviour in unsupervised situations.

The teacher approached me as I had been working in the school for over a year and she also knew that I was researching coherent states in adults and children.
Other behaviour management strategies had been used but there had been little or no success. When she told me of the situation and I had observed the class on a couple of occasions, I thought that involving the children in their own problem solving could be an effective way of approaching this problem. The students were introduced to the concept of action research and the idea of cohesiveness. The study began in March and went until July 2011.

As pointed out by Lewin the first step was to examine the problem carefully. This was done through discussions with the teacher and teacher’s assistant, parents and students. It was then agreed by all parties that it would be an interesting exercise to look more deeply into possible reasons for the non-cohesiveness of the class. The exercise of researching the problem already began to have an affect from the moment the students were included in developing a solution to the problem.

Once the parents and the children had given consent, a conference was held with the students, teachers and myself, exploring more deeply the idea of cohesiveness. This word and concept was a little difficult for bilingual students of this age to completely understand, so the students were asked to role-play different situations of cohesiveness and non-cohesiveness. The students seemed to gain an understanding of the concept very quickly using this method. They described non-cohesive behaviour as being: not concentrated, stressed, rushed and clumsy. The students described cohesive behaviour as being calm, concentrated and moving more slowly.

Factors that could affect the students’ own cohesiveness were then discussed. From the initial group discussions about cohesiveness in the classroom, the concept of ‘the power of one’ was introduced by some of the students. The students asked:

“If one person is cohesive and the others are not, will that then make that person lose their cohesiveness? Or can that person or a few people help to increase the cohesiveness in the classroom, just by being that way themselves.” (April 2011, excerpt from field notes.)
Individual and group workshops were then held for the children to understand their learning preferences and how they were affected when they were stressed. The children also filled out a ‘cohesometer’ for two weeks in the morning and afternoon, as shown in Figure 6 below. They were also given the opportunity to choose activities that they could do during ‘chill out time’ once a week.

![Cohesometer](image)

**Figure 6.** An example of the Cohesometer.

### 6.2.3 Creativity Workshops

These workshops were conducted in 2011 and 2012 with children aged 5 - 14 years either as an ongoing weekly after-school activity called “creativity club”, a 3 day holiday program or as a special ‘in school’ art workshop. The aim of these workshops was to explore the creative process in different contexts, with different ages and paradigms.

**Creativity Club** – This was set up as an after-school program for 1 hour per week. The activity was mainly held in the school art room. The children had access to many different materials that they could use as they wished.
Figure 7. An example of some of the resources available to the children.

There were between 5 and 12 students participating at any one time. There was very little direction given by myself, the club co-ordinator, most of the input was in technical support for child-initiated ideas. Sometimes videos were shown to support the children’s interests or a project that was being undertaken e.g. Alexander Calder’s circus. The children made a video and also composed music for this particular project. At the end of the first year of this after-school club an exhibition was held. Field notes, interviews, photographs and videos have recorded the children’s creative process.

**Holiday Program** – This program was held in the summer holidays. There were 21 children aged 5 – 10 years participating. The workshop was held over three days. The theme of the workshop was Wabi Sabi. On the first day the concept of Wabi Sabi was introduced to the children (Reibstein and Young, 2008). The children were then taken to a local park to explore this concept further by observing examples of Wabi Sabi in nature. They were then given the opportunity to explore the concept themselves using natural materials such as sticks and string.

On the second day the children were told about Japanese Tea Ceremonies and were then invited to conduct their own tea ceremony. There was then an introduction to the work of Japanese Wabi Sabi artist, Terunobu Fujimori, who

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4 Wabi Sabi is a Japanese concept that is a sense of beauty or art that is imperfect, impermanent, and incomplete.
was exhibiting at a local gallery. The children were then taken to this exhibition and had the opportunity to enter one of the teahouses that the artist had built especially for the exhibition.

Figure 8. Japanese Tea house at the Villa Stuck, Munich.

The next day the children were then given more materials to create with – plaster, clay, stones and any other natural materials they had gathered over the last few days. They were then asked to create their own Wabi Sabi pieces. Photographs and observations were made of the children’s creative process over the three days.

“Special Art Project” – This workshop was part of an Art Week for the secondary school. There were 14 students that participated, they were aged from 11 - 14 years. This workshop was named “Asian Art” and was aimed at exposing the students to the art and philosophy of Chinese ink. At the beginning of the workshop students were asked if they would keep an art diary of their impressions and thoughts over the next three days. The children made the diary as they wished. On the first day the children were given charcoal and asked to play with the charcoal in a number of different formats. There were regular ‘meetings’ to reflect on the process. The students spent the day experimenting with the charcoal and different formats. They were also introduced to the idea of Yin and Yang and positive and negative space and used black and white paper to create art pieces on this topic.
On the second day the students were introduced to Chinese ink and how the ink was used in China and Japan over history. The students were also shown a very large brush that I use in my own artwork. They spent the day working with the Chinese ink, first only in black and white but later in colour as well.

On the third day the students were taken out to the neighbouring park to experience being out in nature and were able to use the large brush to create a large joint canvas to be shown in a school art exhibition. The students wrote in their diaries at the end of each day, field notes were made as well as photographs and video to record the students’ creative process.

6.2.4 Prototyping and Play
Prototyping has been used extensively in new product development to help designers try out and test new ideas. However due to commercial time pressures the role of prototyping is often limited. This study builds on existing research into the benefits and limitations of prototyping and starts to explore whether play supports creativity and divergent thinking.

Two workshops were held with twenty postgraduate students from the Cardiff School of Art and Design. The first workshop looked at the concept and perception of play. Following the methodology used by Holmes (1999) with college students in the US, the postgraduate students were first asked to list examples of play and then to rate their playfulness.

Play is often defined as being a spontaneous activity that is joyful, having the absence of consequences and the removal of constraint (Guildford, 1959; Lieberman and Montgomery, 1988). The second workshop looked at the effect of playfulness on creative performance. In this workshop students were initially asked to sketch 10 images that come into their mind (with their eyes open). A time constraint was imposed of a maximum of 10 seconds per drawing, and to draw one image per page.
This task was then repeated, however this time the students were asked to draw the 10 images with their eyes closed. It was thought that when the participants had their eyes closed, they were less likely to judge their performance. Again a time constraint was imposed of a maximum of 10 seconds per drawing, and to draw one image per page. The reason for repeating the task was to see if there were any differences in the resultant images created when the students had their eyes closed.

On completion of both tasks all the images generated by the students were laid out on two large tables for evaluation. All 200 images from the first task (with eyes open) were put on one table and all the 200 images from the second task (with eyes closed) were put on another. All the students were then asked to look through both sets of images and judge which images were more appealing in terms of being creative or novel.

6.3 Quantitative Studies

6.3.1 Play, autonomy and the creative process

Stuart Brown (Brown and Vaughan, 2010) and Michael Schrage (Schrage, 1999) contend that play is an important aspect of the creative process. Sutton-Smith (1966, 1992) stressed the role of play in the development of flexibility in problem solving. In the previous study the role of play and prototyping in relation to creativity was explored. The results of that study raised the following questions:

- Does play support creative problem solving?
- Does play need to be related to the task at hand?
- Does the form of play affect the creative problem solving performance?

The aim of this study is to try and answer these questions. In looking at the question of whether play needs to be related to the task at hand, what is actually being asked is the question of whether the role of play is directly connected to prototyping or whether there is something deeper going on.
Stuart Brown (Brown and Vaughan, 2010) describes play as being an altered state, exploring the possible in which joyful emergence occurs. Csikszentmihalyi (1996) describes the concept of ‘flow’ during the creative process where people have the feeling of things as “almost automatic, effortless, yet highly focused state of consciousness”. Csikszentmihalyi highlights nine elements of flow as pointed out earlier in this thesis: “There are clear goals every step of the way; There is immediate feedback to one’s actions; There is a balance between challenges and skills; Action and awareness are merged; Distractions are excluded from consciousness; There is no worry of failure; Self-consciousness disappears; The sense of time becomes distorted; The activity becomes autotelic “ (1996, pp. 111 - 113).

These ideas of play putting a person into an altered state or as being an aspect of the Flow experience suggest that there may be a deeper element to play. In order to begin to establish that play is providing something more than just obtaining physical feedback and experience, it was important to understand the role that play has in relation to such tasks as creative problem solving.

Therefore, this study was designed to explore whether play supports creative problem solving, to explore four different forms of play and if the form of play is a factor in the creative problem solving. Duncker’s candle problem (1945) was used as the creative problem solving challenge. Duncker’s candle problem has been used in a wide variety of psychological studies and is accepted as a good creative problem-solving task. In the original task developed by Duncker, participants sit at a table next to a corkboard. On that table are a candle, a box of drawing pins and book of matches. The task is to attach the candle to the wall, without wax dripping onto the table when the candle is lit. The task was modified for this study because books of matches are not so easily available and boxes of drawing pins no longer come in cardboard boxes as described by Duncker. Therefore we provided a standard (cardboard) box of matches, a candle and a handful of loose drawing pins. See figure 9 below.
The task was then presented in written form and participants were allowed to write or draw the solution. Fifty participants were randomly selected from a larger group of undergraduates of the product design and architecture departments at the Cardiff School of Art and Design. Participants in the study had no previous knowledge of Duncker’s candle problem. Participants were randomly assigned to five different conditions to see what effect different forms of play had on solving the problem. Ten participants were in each condition.

These conditions were:

- Social Play: In this condition participants were allowed to communicate with each other via a Facebook application on their mobile phones. They were instructed not to talk to each other during the task.

- Imaginary Play: In this condition the participants were given the task in the form of an imaginary story. The imaginary story was:

  
  **Once upon a time you went into an enchanted forest. You went there because you had heard that there was a magic castle on the other side of this forest.**
You had decided that today was the day you would go to that castle. As you entered the enchanted forest you saw bushes filled with lovely berries to eat. You felt hungry but decided not to stop and pick the berries. You came across lovely patches of soft green grass but you did not lie down on them, as you were determined to get to the castle. You even saw playful pixies trying to tease you into chasing them. But you kept going through the forest. Eventually you came out the other side of the forest and before you stood a rather grand but rather strange looking castle. It was not round but not square either. It was quite tricky to find the entrance but being rather clever, you ended up finding how to enter the castle. After you entered you found yourself standing in front of a magnificent spiral staircase. You decided to climb the staircase. At the top of the staircase was a cosy little room. Feeling rather tired by now you went into the room to see if there was somewhere to sit. Standing in the room was a wise old wizard, and he said, “Ah, I have been waiting for you.” He continued, “You have shown that you are perhaps worthy to be my apprentice. You have passed through the enchanted forest without being distracted or tempted to stay. You have found the entrance to the castle and you were brave enough to climb the spiral staircase and enter this room. Now you have just one more task to complete which will show me that you are meant to be one of my apprentices. And of course you answered “What must I do, oh great and wise master?” The wizard points to a table. On this table you have a candle, a box of matches and some drawing pins.

Non-Related Play: In this condition, before being told of the task, participants were asked to take part in a game that was not related to the challenge. The game used was the ‘Human Knot’. In the ‘Human Knot’ game all of the ten participants were asked to stand in a circle.
Then, each person was asked to place their hand in the middle of the circle and to grasp another person’s hand – then they do the same with their other hand, ensuring that they take the hand of a different person. The group then tries to unravel the ‘Human Knot’ by unthreading their bodies without letting go of each other’s hands.

- Physical Play: In this condition the participants were given the actual materials (the candle, the box of matches and the drawing pins) to manipulate in order to help them solve the problem.

- No Play: In this control condition, participants were just given the written instructions and asked to solve the problem.

All participants were given a maximum of five minutes to complete the task. All participants attempted the task and recorded their solution independently. The time taken for each person to complete the task was recorded. If the solution was not completed within the assigned time, it was recorded as a time of 5 minutes with no solution.

6.3.2 Modal Preferences in creative problem solving
The idea for this study came initially from observations of children. In working with children for over ten years, consistent patterns of behaviour had started to emerge. One of the most prominent behaviours observed is this natural tendency of children to want to touch, manipulate or play with the objects involved in their learning (Pepler, 1982). This tendency was so strong that it seemed important to ask whether adults had retained this tendency, especially in the area of creative problem solving. This study was aimed at exploring natural preferences by asking whether the adults preferred playing with objects on a computer screen to solve a creative puzzle or by solving the puzzle ‘in their heads’.

There were a total of 60 participants involved in this study, the majority of who were from the product design programme at Cardiff Metropolitan University.
Participants were asked to sit in front of a computer monitor where they were presented with a puzzle on the screen. The puzzle that was used was derived from a De Bono lateral thinking puzzle (1977). There were three shapes, which were two-dimensional and participants were instructed to create a shape that looks three dimensional from these three individual shapes.

Figure 10. Screen shot of the puzzle as presented to the participants.

The initial design had only two conditions;
Condition 1: participants were allowed to choose at the onset of the task, which method they would like to use to solve the puzzle – either in their heads (thinking) or by using the mouse to rotate or move the shapes (playing). They were timed as to how long it would take them to create the three dimensional shape.

Condition 2: participants were asked to solve the puzzle in their heads (thinking) and were timed as to how long they took to solve the puzzle. They were later asked which mode they would have preferred to use if they had been allowed to choose at the onset– either in their heads or by using the mouse to rotate or move the shapes.

Whilst conducting the study for these two conditions it became apparent that there were two issues that were not ideal in obtaining clear results.

1. The majority of participants were design undergraduates and therefore found the puzzle to be quite easy to solve.
2. The manual manipulation was a little difficult in the program we were using and the actual moving of the shapes was having a negative affect on the solving time performance, which was not reflective of the actual solving of the puzzle.

In response to these limitations two more conditions were introduced to the study:

Condition 3: Participants were allowed to choose at the onset which method they would like to use to solve the puzzle – either in their heads or by using the mouse to rotate or move the shapes. They were asked to tell the experimenter when they had solved the puzzle. If their verbal response was correct, even though the actual shape had not yet been made, the verbal response was time stamped as the performance time.

Condition 4: Participants that were not design students were selected for this condition and were allowed to choose at the onset which method they would like to use to solve the puzzle – either in their heads or by using the mouse to rotate or move the shapes. They were asked to tell the experimenter when they had solved the puzzle. If their verbal response was correct, even though the actual shape had not yet been made, the verbal response was time stamped as the performance time.

Once the participants had completed the initial problem-solving task, they were then asked to fill out a questionnaire about their problem solving preferences.

6.3.3 Heart Rate Variability

I think at this point it is important to give a little more information about Heart Rate Variability (HRV) and mental states, as HRV is the measurement that is being used for investigation of mental states in these next studies. A mental state is said to be a function of the interaction of cognitive factors with a state of physiological arousal (Schachter & Singer, 1962).
Mental states have been found to have physiological signatures. Several physiological measures have been used as an index of user mental effort and mental workload (Kramer, 1990; Lasur, et.al, 2000).

There are in general two classes of physiological measures: central nervous system and peripheral nervous system measures. The most popular physiological techniques employed in the assessment of mental effort and mental workload in the last 30 years has been measures of cardiac activity (Rowe, 1998).

Heart rate variability has been shown to be one of the most promising methods for measuring Autonomic Nervous System (ANS) activity (Malik, 1996). Heart rate variability (HRV) is the variation in the time interval between heartbeats, specifically the variation in RR intervals of the Electrocardiogram (ECG). Figure 11 below shows how the RR interval is calculated in an ECG.

There is evidence to suggest that there is a close relationship between HRV and neural activity in the frontal midline area of the brain (Kubota et.al, 2001) and that there is a link between mental states and HRV (McCraty et.al, 1995). One of the important aspects of this measure is the characteristic of the signal, which changes for different mental states such as frustration or appreciation (McCraty et.al, 1995). During frustration the HRV signal is of a more random nature, while during a feeling of appreciation the HRV signal is more periodic (orderly).

The mathematical measurement of coherence is used by McCraty et. al to describe the level of order (predictability) within the HRV signal. The coherence measurement is then categorized into low coherence, medium coherence and high coherence. Examples of these three HRV signal patterns are shown in figure 12 whereby a regular, sine-wave-like form characterizes a coherent pattern.
(a) Low HRV coherence

(b) Medium HRV coherence

(c) High HRV coherence

Figure 12. Examples of the low, medium and high HRV coherence measures of the same person over a similar time frame of approximately 40 seconds.
HRV has the additional advantage over Electroencephalography (EEG) recording because of its simplicity of use and reliability.

### 6.3.4 Mental States and Creativity

Dijksterhuis and Meurs (2006) explored the relationship between incubation and divergent thinking by running a comparative study of “different modes of thought and the generation of creative and original ideas”. They hypothesized that “non-obvious or original thoughts are more likely to be elicited by incubation than by focused, conscious thought”. The results of their studies showed that a period of distraction (using a method spent on conscious mental work on another problem) led to higher divergent thinking when compared with consciously focusing on the task at hand.

The aim of this study is to explore Wallas’s (1926) second form of incubation, i.e. “relaxation from all conscious mental work” in relation to creativity by following a methodology similar to Experiment 1 of the work of Dijksterhuis and Meurs (2006). “Relaxation from all conscious mental work” will be referred to in this study as “mental relaxation” and will be the third condition of the study. This study was inspired by previously run creativity workshops with undergraduate and postgraduate students exploring the role of mental states in the context of product design and innovation. These creativity workshops seemed to show a connection between the mental state of a person and their creative output.

Ascertaining a person’s mental state in the workshops was based mainly on qualitative observations, however the students’ mental and physiological states during the creative process were also monitored using Heart Rate Variability (HRV) as an indicator of mental state. During the creativity workshops, participants were asked to undertake a design challenge.
Whilst observing the participants in the incubation stage (of the creative process) it was found that there was a change in the pattern of the HRV signal from a random signal to a more periodic (orderly) oscillation, i.e. from low to high coherence. Tiller, McCraty and Atkinson (1996), had shown that this effect of the change in HRV pattern from random to more orderly (captured by the coherence values) could be used as a quantifiable measure of a person’s mental state.

This idea that one could quantifiably measure a mental state led to the idea of studying mental relaxation in relation to creativity whilst monitoring the HRV of a person. Wallas had proposed that incubation could take two forms: mental distraction or mental relaxation. Dijksterhuis and Meurs (2006) had been looking at mental distraction and how it affected divergent thinking. This study is aimed at exploring Wallas’s (1926) second form of incubation, i.e. “relaxation from all conscious mental work” in relation to divergent thinking. HRV measures were thought to be able to reflect mental relaxation; therefore the participants HRV was also measured in this study.

The methodology of this study was modeled upon Experiment 1 that Dijksterhuis and Meurs conducted as part of a series of studies investigating incubation in 2006. In their series of studies, participants were instructed to generate a list of items in different circumstances and under three conditions. The first condition was called the immediate generation condition, which was seen as the baseline, and participants started right after receiving the instruction. In the conscious thought condition, participants were given three minutes to consciously think about the items before they were given time to list them. Finally, in the unconscious thought condition, people were first given the instruction and were then distracted for three minutes before they were given the opportunity to list the items.
In experiment 1 of the series of studies conducted by Dijksterhuis and Meurs, five examples are given of existing names of pasta and all examples ended with the letter “i.” Dijksterhuis and Meurs hypothesized that conscious thought leads to more generated pasta names that end with an “i” (“converging items”), whereas unconscious thought was expected to generate more names that do not end with an “i” (“diverging items”). That is, conscious thinkers are expected to follow the cue more rigidly than unconscious thinkers (Dijksterhuis and Meurs, 2006).

In the case of this study, forty-eight design undergraduate students from Cardiff Metropolitan University were recruited to participate in this experiment. They were randomly assigned to one of three conditions: an immediate generation condition, a conscious thought condition, and a mental relaxation condition, with 16 students per condition.

Participants worked in a separate room and instructions for the exercise were given in printed format. The experiment was introduced as being an experiment on the role of play in Enquiry Based Learning. In the instructions, five examples of existing pasta names were listed, all ending with the letter “i”. Participants were asked to generate new names for pastas. The participants were hooked up to a monitoring device that recorded their Heart Rate Variability (HRV).

After participants read the instructions, they were randomly allocated to one of the three conditions;

- In the immediate generation condition, they were immediately asked to list new pasta names. They were given one minute to complete this task.
- In the conscious thought condition, participants were given three minutes to think about new pasta names before they were given one minute to list new names.
- In the mental relaxation condition, participants were told that they would generate the pasta names sometime later and that they should
first ‘chill out by watching the monitor in front of them for a few minutes’. These participants were then shown three minutes of a Coherence Coach (2011) program on a monitor. The Coherence Coach program by HeartMath was used to assist the participants to move into a ‘relaxed mental state’. After the three minutes, the program was switched off and participants were then given one minute to list the pasta names.

Once each participant had completed the task they were asked for feedback on how they found the task and what strategies they had used to generate the pasta names. In the third condition they were asked whether they had felt relaxed during the 3-minute relaxation time and what had helped them to relax.

6.3.5 State of Being and dynamic movement

In the previous study the results suggested that mental relaxation has a positive effect upon creativity (explained in section 7.3.3). However the relationship between mental relaxation and creativity could be due to two possible reasons. The first being, that mental relaxation is simply another form of distraction. The second being, that mental relaxation is a particular mental state as reflected in HRV coherence values. From the previous study it was unclear whether the mental state is a possible factor affecting creativity, therefore it was important to begin to look more closely at high coherent HRV in relation to creativity, which is what this next study is about. The aim of this study was to repeat the task used in the previous study but only with participants that reached a high HRV coherence reading first.

Twenty-one undergraduate design students from Cardiff Metropolitan University were recruited to participate in this experiment. Each of the students was given a ‘training’ session before the actual study begun. In this training session the participants were able to experience how to move into a high coherent state. During this training, the participants were asked what strategies they had used to obtain a high coherent state. The Coherence Coach by Heartmath (2011) was used for all the participants, most of who reported that it was helpful but in different
ways. Many of them found the ‘key’ to what got them into a high coherent state. The experimenter recorded information about this process of moving into a state of high coherence. Figure 13 shows the set up of the room, with an image of the coherence coach playing on the television screen.

![Figure 13. The set up of the room where the study was conducted.](image)

A few days later the participants began the study. The participants were brought individually into the same room where they had had their training. They were then reminded of what brought them into their high HRV coherent state. Once they were able to achieve that state, they were then asked to complete the task, which is the same task used in the previous study whereby participants were instructed to generate new names for pasta. Five examples were given of existing pasta names and all of these examples ended with the letter “i”. The participants were given one minute in which to generate as many new pasta names as they could, their
HRV was recorded throughout the whole process. At the end of the task a short interview was held.
Chapter 7  Results

7.1  Introduction – In this chapter the results of each of the studies of this research series will be reported. These studies have again been put into the categories of qualitative and quantitative studies, however there will be some qualitative data reported in the quantitative studies that is relevant to the findings.

7.2  Qualitative Studies

7.2.1  Fascinating Journey – the journey begins

These are the results of my self-study of the creative process, comparing my experiences of the creative process as an artist with my experiences of the creative process whilst undertaking the PhD research.

When reflecting upon the creative process, I realized that there were a multitude of factors that come into play when creating a new piece of art or coming to an insight. One thing that became apparent fairly quickly was that this process was by no means a linear, sequential process. It seemed to be similar to the description given by Robinson (2009):

"it is about a more, organic conception of human existence in which the different parts of our lives are not seen as hermetically sealed off from one another but as interacting and influencing each other." (pp.223)

I recorded the many different factors and conditions that became apparent as part of the creative process over the years. Below I point out the most poignant factors that were consistent throughout my creative process in painting, creating poetry or researching for the PhD.
State of Being

I found that I needed to be aware of how I was feeling whilst approaching the PhD. This was also something that I had done in creating art pieces.

Being aware of whether I was relaxed, frustrated, tense or thinking too much, seemed to have a direct affect on how my artwork would progress. I often found that when I thought too much about a project, I produced my worse pieces of art! I found this to be also the case with the PhD work. When I was 'too much in my head', I was unable to come up with a creative approach or new ideas. This has been found in other studies and theories as well (Dijksterhuis and Nordgren, 2006; Wallas, 1926), where it was found that moments of distraction or relaxation were very important to the creative process. This led me to conduct the ‘correlation between mental states and creativity’ study (section 6.3.4 and 7.3.3) that explored the idea of distraction, mental relaxation and physiological responses.

Reflecting upon my emotional state also gave me insight as to when the ideas flowed effortlessly. I found that when I was in a stressed state or was not emotionally open to my environment, I was less likely to be able to produce good work. This state of openness is an intriguing one. It was almost like returning to a child-like state that had little to do with thinking things through, but more to do with being present in the moment and enjoying the experience. I often used music, meditation and play to move me into this state, as these methods seemed to be the most effective methods for bringing about this child-like state quickly. The paintings in Figure 14 were painted in Chinese ink, after I had completed an hour-long meditation session for each.
Having said that mental relaxation was important, a certain element of tension seemed to also bring about some incredible insights. I found that often the biggest paradigm shift seemed to occur after a period of dissonance. By dissonance I mean a kind of non-harmonious tension. Great artists, musicians and scientists who found that they had ‘hit a wall’ have often described this experience of dissonance. They were unable to grasp the answer or insight and often felt a great deal of frustration. This often occurred just before giving 'birth' to an incredible idea or piece of artwork (Csikszentmihalyi, 1996; Policastro and Gardner, 1999).

There were very real moments where I experienced and heard reports personally of this phenomenon of tension bringing about creativity:

   taxi driver: so you are studying creativity.
   myself: yes, just a small subject!
   taxi driver: when I was a Marine Captain I found the time when I got my Marines to be most creative was when their back was to the wall. Then they really showed innovation. (Conversation with taxi driver who was a retired Marine Captain, May, 2011)

**Journal Entry June, 2010**

Have just been for a walk as I had so many questions flying around my head! Felt like I was drowning in a sea of questions. Was almost overwhelming and frustrating. As I was trying to calm down I had the feeling that these questions are important as long as I take them one at a
time or better said answer them when they come naturally. I felt that it was the same organic process all over again. I needed to stop doing it from my mind and just let the connections appear when it was natural for them to do so. This feels like an important insight....and I feel calmer now.

I often had moments before creating a special art piece or poem where I really struggled and felt blocked. This phenomenon of dissonance before an important creative insight is an interesting area to look into further.

**What about Love?**

Very much linked to the emotional state is the feeling of loving what you do. In many psychological studies it was shown that creative people differ from one another in a variety of ways but in one respect they are unanimous: they all love what they do (Csikszentmihalyi 1996; Amabile 1989; Collins and Amabile 1999; Henning 1988). This aspect of loving the work I can definitely attest to. The subject of the creative process has me completely captivated – in my own creative process as well as the research of the creative process. Many people involved in their art or in a field where they showed exceptional creativity reported ‘loving’ what they do (Collins and Amabile, 1999; Csikszentmihalyi, 1996). Love is a term that is given to many different interpretations. In this case, I can only describe what I mean by loving what I do. I am deeply engaged in the process, passionate about what I am doing and take great pleasure in the subject, even when the activity itself is not particularly enjoyable and requires effort.

The process, as well as the subject is something that I am passionate about, which makes the work seem so much more enjoyable. This is not to say that there is no effort in the work, I find that I work very hard but there is also pleasure, because I am completely engaged in what I am doing, often to the exclusion of everything else. When I am completely engaged, time seems to stand still. This is the case when I am painting or deeply engrossed in writing an article for research purposes or even carrying out a study.
State of Mind

Guilford (1950) proposed traits of creativity that included divergent thinking, where divergent thinking was defined as the exploration of many possible answers rather than thinking toward one right answer (convergent thinking). In both my art and the research work it was very important how I approached the work cognitively. I found that it was essential to stay open minded to many different possibilities. This open mindedness seems to be in line with Guilford’s concept of divergent thinking. When I was willing to consider many different possibilities, then the most surprising and creative moments occurred. In the research work it has been imperative that I was open to creativity showing up in places it was not expected to be. For instance,

**Journal Entry, September 2011**

I can’t believe I just spent an hour and a half at customs! I missed my train and am so annoyed by that customs guy. But in the end I forgive him actually because of his last comment. So they weren’t going to let me in the country because he believed I needed a visa because I was studying. Even though I am a permanent resident in ********. He was so annoyed when he came back and his very sarcastic statement that his supervisor was being “creative” was actually spot on. She was able to think outside the box, and luckily understand that I was no risk of being an illegal resident. I guess her being able to see more than one possibility is exactly what I am talking about when I talk about creativity – so he was right!! (But not happy)

In Figure 15 this art piece actually started its life as an underlay sheet of rice paper. It was under the actual pieces that I was painting in Chinese ink. When I discovered that an imprint had been made on this piece of rice paper, I had the feeling maybe this could lead to something interesting. So instead of throwing the underlay sheet of paper away, I started to paint more pieces on top of it. As I did so, I saw the piece start to develop.
I was wonderfully delighted by the fact that I was creating an art piece whilst creating another art piece. It was an indirect piece that was complex and interesting. This is, I believe, one of my most interesting pieces because of the way that it was developed. This could only have come about because I was open to the idea that the underlay sheet could be something other than what it had originally started out as.

![Figure 15: Impressions. Chinese ink on paper.](image)

**Play**

When we are open-minded we are also more open to exploring our world through play. Play was another incredibly important aspect to the creative process. There were many different forms of play that seemed to be important. Sometimes the play was with actual technology or material. Often in art I would play with the
material to see what it could do, before learning about the formal use of the material. This type of play often led me to use unusual combinations of material. Playing with the transparent aspect of the rice paper and juxtaposing it over the very opaque oil on canvas, created this award winning painting in Figure 16.

![Image](image.png)

Figure 16: “What it’s really all about.” Mixed media.

At other times the play was with concepts, asking myself ‘what if?’ or I would play by day-dreaming or using humour to play with an idea:

**Journal entry. November, 2010**

I just watched “Life of Brian” again. My favourite part made me chuckle: “Look you’re all individuals.” And the crowd says back “Yes, we’re all individuals” and then a guy in the crowd pipes up “I’m not”. I love that bit. It got me to thinking if we changed the word individual to creative – it kind of seems like the same thing.... must look into this more”

The aspect of play in creativity has been reported in some other studies as well (Mainemelis and Ronson, 2006; Ziv, 1976) but this is also an area that requires further enquiry.

**Environment**

I guess another form of play could be movement. I found that it was a necessary part of my creative process; going for a walk, changing the environment around me or doing something completely different, and often led me to my greatest insights.
By observing the importance of movement and interaction with my environment I was led to further investigating how we process our world, looking at tactile and kinaesthetic stimulation, with regard to information processing. In September 2011 I conducted the study on ‘modal preferences and creativity’ looking into the role that manual manipulation of materials had on creativity (see sections 6.3.2 and 7.3.2).

Another area that is closely related to the affect the surroundings can have, is that of the changing environment (Sternberg 1988). I live in one country but am doing my PhD in another. That means that I have to travel quite a lot in doing my research and meeting regularly with my supervisors. What I found was that travel, as well as putting me in a new setting, seemed to be a very productive set of conditions for the creative process. This has also been found in other studies (Shapira, & Liberman, 2009) where they found that the change of scenery seemed to support and even enhance the creative process. This important aspect of travel may be because I was away from the everyday routine or as Bohm (1996) describes:

“there is a routine and mechanical kind of perception that we carry out habitually in dealing with what is familiar...But real perception that is capable of seeing something new and unfamiliar requires that one be attentive, alert, aware and sensitive.” (pp. 5)

I found that simply by being in a new environment I was in a state of alertness, because the surroundings were unfamiliar to me. These conditions seemed to make it easier to be in a state of mind that was aware and sensitive.

The actual environment itself also played an important role for the creative process. The environment could be inspiring, whether from the landscape or some other ascetic quality, or whether because the lighting is good or it is secluded enough to allow me to enter into a concentrated space. The painting in Figure 17 is a large oil painting of the golden Raps fields that one drives past on the way to Vienna in spring and summer.
Journal Entry. June 2000

After coming back from a trip to Vienna I just have to paint the Raps. I know that I don’t normally do landscape, but the feeling that I got when I saw those fields was so positive and radiant that I just have to paint it. I hope I can convey a similar feeling for others to share what I experienced.

Figure 17: Fields of Gold. Oil on canvas

I was very particular where I stayed whilst I was researching or writing, as I found that I was able to work far more effectively and creatively when I also had access to nature. This enabled me to go for walks or simply look out onto open space. The factor of the surrounding environment has been shown to support creativity in other studies as well (Moultrie, J. et al. 2007; Magadley and Birdi, 2009; McCoy and Evans, 2002).

My tools

Just as the environment I was in played an important role, the tools that I used, also contributed often to my creativity. An interesting insight came to me about my tools for the research work. At first it was difficult to define what they actually were. The books and the journal articles would be the first tools that I began using.
But I quickly came to see that my repertoire increased as I gained a more proficient understanding of my medium. I was using technology to access information in many different forms, engage in dialogue and at one point to analyse data collected in separate studies. Dialogue in itself was a very powerful tool. It enabled me to reflect externally some of the ideas and concepts that I was formulating. It also enabled me to critically reflect on where I was going and where I had come from. The dialogue often helped birth new ideas as well.

**Conversation with Peter. August 2010.**

*The absence of creativity is disorder (from Bohm)*

*Is creativity a thing?*

*Does it have to manifest?*

*What is the motivation of enquiry?*

Sometimes as with an art piece I found myself allowing the tools to take me where they wished. Exploring by searching the libraries, Internet and new technologies that I became exposed to led me into interesting places. It also led me to conduct research next to my PhD, 'just for the fun of it' which is what I did very often with new mediums in fine art. Other observers of the creative process have reported this playful, childlike approach (Bohm, 1996; Csikszentmihalyi, 1996; Sternberg, 1988).

**Playing with Language.**

In looking at language in relation to the creative process it was apparent that the playful approach as well as the challenge of learning a new language led to inventive and creative ways of approaching this particular tool. An example of this could be the very simple ‘poem’ I wrote in 2001:

*Ich bin Du*
This was a play on words and concepts that came from playing with the German language and the cultural aspects of this country. In Germany, people can only really use the informal ‘du’ when they feel comfortable with someone or to denote a closer relationship with another person. The actual translation “I am you” has the double meaning of saying we are all one or reflections of one another, as well as the Poet herself saying: I allow you to be close to me.

**The Dance of the Creative Process**

Just as there were specific factors that were common across the two conditions of art creation and research, there appeared to be specific movements that were also found in the art realm as well as the research realm. By movement I mean; how the process seemed to unfold in time and space.

**Tempo**

An interesting observation that seemed to be common across the two different fields was about the tempo of the work. Just as it was with my painting, the research work seemed to take on a life of it’s own. Often waking me up in the early hours of the morning, wishing to be expressed. In fact these sentences are being written at 4 o’clock on the morning of the eclipse. I woke up with a sentence in my head, which then led me to more. All of which seemed to have the strong desire to be written down. As the work was naturally unfolding it seemed to do so at an exponentially fast pace. This was often the case with my painting, where an art piece would keep me completely absorbed and would unfold in one night.

**Meandering**

Meandering has been an extremely important aspect of the creative process in both my research and my artwork. I define meandering as exploring seemingly unrelated themes and ideas without any intention of trying to connect them. It’s like wandering through a forest of ideas with no plan in mind, just enjoying the walk. I began the journey of the PhD by allowing myself to explore at random.
I would just read articles and books that seemed to be interesting. Often the articles and books would lead to more avenues in that specific direction. At other times they would lead me into a completely different direction.

The first area where I found myself, was at a very obvious point of defining what creativity was, but this very quickly led me from psychology to quantum physics to pure mathematics. In many ways I was not sure how I got there, which was often the case when I approached my paintings. They would simply start to unfold before me. In Figure 18, I started to write a poem but as I was writing it, I had the feeling that I also wanted to have an image with it. This initial idea led me to start a series of paintings that were inspired by the poems that I wrote.

Figure 18. Excerpt from my Art Journal. 2010.
Often in my art and research work, it seemed very important to just allow myself to explore and follow an intuitive approach. What I found was that this naturally led me to cross disciplines and to find common ground where it had perhaps not been seen before. New contexts seemed to be appearing for concepts that had been securely fixed in one place. I followed ideas that led me to conduct studies that seemed unrelated, only to find later, that there was a clear and often extremely cogent connection.

I allowed myself to explore whatever engaged me. Then, if things naturally fitted together or led to a conceptual leap then this was a lovely event that fell into place with little or no mental effort on my part. This phenomenon, which is sometimes, referred to as the 'Eureka' or more humbly the 'Ah Ha' moment has been spoken of by researchers and theorists of creativity in many different fields (Goswami 1993; Csikszentmihalyi 1996; Bohm 1996; Wallas 1926).

**Journal Entry. May 2010**

God, I just had a very weird experience. I was reading about gravity and Newton sitting under his apple tree. It felt like something expanded as I was reading and I knew something very important was coming, so I stopped reading. Time seemed to dissolve or stand still or something. My head felt lighter as I just sat picturing Newton and the tree. Then I kind of felt it, like the apple was falling to the ground except it kept falling. Where was it falling to? I just kept going with the apple and it was like it was falling into the atoms and then into the quanta until it had fallen into itself and everything else. That’s when the thought came – That’s where creativity comes from!! Now how the hell do I explain that???

I would like to look more into the area of insight at a later date, as I believe that the implications of this process are extremely important to the creative process. This area also seems to have been rekindled as a phenomenon to explore further by creativity researchers (Mayer, 1999).
The idea of insight and spontaneous creative moments leads me to the next point about time. Just as is often stated in the literature (Csikszentmihalyi, 1996; Von Müller, 2010; Goswami, 1986; Gardner, 1993) time seems to take on plasticity. When I was deeply involved in the creative work hours felt like minutes or even less. It seemed that when my mind was still then time fell away.

It was almost as if time was inversely related to movement of my mind. The more busy and full my mind was the more minutes felt like hours, but when I became mentally still and focused then the stranglehold that time normally had on me, seemed to disappear and then time no longer entered into the equation of what I was doing. Von Müller (2011) talks about an expanded, nonlocal time-space of the present, he sums this up very well with the help of Heraclites:

> It is an expression of the en-panta (all-in-one and one-in-all) aspect of reality -whose unfolding is guided through out by itself in its entirety, in most powerful hidden harmony, thus following and fulfilling the inherent logos of (the taking place) of reality. (p.17)

Henri Bergson also talked about duration as being the universal experience of time, which allows one to tap into universal knowledge. In the creative process, as I describe in my Journal entry of May 2010, it was as though time had dissolved and then I had this incredible insight about the source of creativity which has underpinned a great deal of my work since then.

When I was deeply involved in some of the work, either writing or researching, time just seemed to disappear and before I knew it, hours had passed. This is what happened when I began writing my observations, at first I was just playing with some ideas but then as I became more involved and focused on what was I was writing, I became unaware of the time and seemed to be totally in the present.
This phenomenon has been described by Csíkszentmihályi (1996) and has been discussed for decades with regard to the role it plays in the creative process (Bergson, 1946; Bohm, 1996; Von Müller, 2011). Perhaps on a very deep level this aspect of time and movement are core to creativity. I would definitely like to explore this area further but perhaps not under the PhD at this point, as it seems to be a very in-depth topic that could take one’s lifetime!

### 7.2.2 Cohesive Classroom

This was an action research study undertaken in a private school in Munich, Germany. This study focused on a third year Primary class (children 8 - 9 years old), a class teacher and a teacher's assistant. The study was started in March, 2011 and was aimed at identifying the factors that affect cohesiveness in a classroom setting. The children understood cohesiveness in this context as behaving in a calm, concentrated manner. This particular class was chosen due to the fact that there had been on-going problems with how the class members were interacting with one another and the teachers.

The children were exhibiting difficult behaviours in transitioning between lessons, in their interaction with one another and poor, irresponsible behaviour in unsupervised situations.

### Understanding cohesiveness

The children role-played cohesive and non-cohesiveness. They then were able to verbalize what these concepts meant to them: not concentrated, stressed, rushed, clumsy. Cohesive behaviour was described as calm, concentrated and moving slowly. The students and teachers also reported that they lost cohesiveness when they were rushed, stressed, yelled at and tired. They reported becoming more cohesive when they could play, do sport, listen to music, be massaged and draw.
The Power of One

With the introduction by the students of the concept of the ‘power of one’, we decided to look at the individual first and then move onto the group. We started by trying to understand ourselves better i.e. how we process information and what happens when we are stressed. We started by using a VAK\(^3\) test derived from Haberda (2005) to look at how the students and main teaching staff of the classroom naturally process information. This test was aimed at gaining a rudimentary understanding of the learning preferences of the students and teaching staff. Observations of, and self-reporting from the individual class members were also carried out to compare the findings of the VAK test to ensure greater consistency (Fleming, 1995).

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<tr>
<th>Tactile/Kinesthetic</th>
<th>Visual</th>
<th>Auditory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Students</td>
<td>16</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 1 - the number of students and their preferred learning style.

Table 1 shows that the majority of the class had a preference for learning through Tactile/Kinaesthetic modalities. Tactile/Kinaesthetic learners prefer to learn via experience—moving, touching, and doing i.e. active exploration of the world (Fleming, 2006).

Hannaford (1995, 1997) talks of the Brain Dominance Profile (BDP) and the affect that stress can have on an individual’s performance. A workshop was conducted, whereby the students tested themselves and each other to determine their BDP. The students recorded their findings on a large life-size drawing of themselves. Later the results were checked on an individual basis using methods suggested by Hannaford (1997), Haberda (2005) and a professional lerntainerin.\(^6\)

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\(^3\) VAK test – A measure to determine dominant learning styles Visual Auditory Kinesthetic. This test was derived from Haberda (2005) and was written in German.

\(^6\) A lerntainerin assesses the child’s strengths, skills and weaknesses to develop and individual learning profile. S/he then uses this information to devise a plan for the child how to study most
Some of the initial results were revised after testing and individual conferencing. Table 2 shows a breakdown of the findings of the BDF of the students.  

<table>
<thead>
<tr>
<th>Brain Dominance Profile (BDP)</th>
<th>Number of students</th>
<th>Right Brain Dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>6</td>
<td>X</td>
</tr>
<tr>
<td>DD</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>LL</td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>FF</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>II</td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>JJ</td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>PP</td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>EE</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>KK</td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>H</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>N</td>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>HH</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 – Brain Dominance Profile of the students and the number of right brain dominant profiles

The results shown in Table 2 give a break down of the different dominance profiles as categorized by Hannaford (1997). Also shown are the numbers of profiles that are right brain dominant (9 out of 15). This is important, as people who are right brain dominant have been shown to have a greater tendency to be efficiently and learn in the way that is most natural to him/her. Areas of weaknesses will be analyzed to establish the cause of the difficulties and will be addressed in a fun and playful way to equip the child with all the skills necessary to learn easily, joyfully and independently.

7 For a list of the Brain Dominance Profiles please see the appendix
creative and approach learning differently (Hannaford, 1997; Hermann, 1991). They feel easily constricted in a very structured environment (like a school day) and tend to “shut down” in stressful situations, unable to manoeuvre themselves out of it. This creates tension in their immediate environment (Hannaford, 1995).

**Chill out Time**
A development that naturally occurred whilst the individual conferences were being held was the possibility of free time for the students who were not being interviewed. This happened at the time that was originally put aside for the class to work as a group. This free time was named "chill out time" and had the following conditions:

> "You can do whatever you like, in the classroom, as long as you are not disturbing the other people around you. You can do things in small groups or by yourself" (Excerpt from Teacher’s instructions, end of April, 2011).

This ‘chill-out time’ became an extremely important factor for the cohesiveness of the classroom. The students valued this time immensely and looked forward to it.

> “Can we PLEASE have chill out time??” (This question was asked on one occasion by 18 of the 21 children of the class, at the beginning of the session put aside for the study.)

Towards the end of the study when the students were asked what helped them most to reduce their stress and feel more cohesive, almost all of the class reported, "chill out time". In this ‘chill out time’ students were allowed to pursue something quietly that they enjoyed in small groups or individually. The activities varied sometimes but for the main part they consisted of drawing either as a small group on large paper or individually, playing with building blocks, inventing board games, massaging one another or reading. Relaxing music was often played in the background.9

---

9 Listening to music regularly (along with replaying tunes in our brains) has been found to keep our neurons active and alive and our synapses intact. Listening to the right music does appear to facilitate learning, and participating more fully in music making appears to provide additional cerebral advantages. Further, some music supports hemispheric synchronization, offering the opportunity to achieve brain coherence and significantly improve learning. (Bennett and Bennett, 2008)
Cohesometer

At around the time that the individual testing of students’ learning styles and BDP were finished, an interview with the teacher led to the idea of the students becoming more aware of how they were feeling. This was suggested as the first step to the students beginning to take responsibility for their own actions and feelings. A simple tool for self-reporting was developed and called the Cohesometer (see figure 19). This tool was given to all class members at the beginning and the end of the day for two weeks.

Wednesday: ____________________________

<table>
<thead>
<tr>
<th>Morning</th>
<th>Very Good</th>
<th>Quite Good</th>
<th>O.K.</th>
<th>Not O.K.</th>
<th>Stressed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Comment: ____________________________

<table>
<thead>
<tr>
<th>End of Day</th>
<th>Very Good</th>
<th>Quite Good</th>
<th>O.K.</th>
<th>Not O.K.</th>
<th>Stressed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Comment: ____________________________

Figure 19. An example of the Cohesometer.

The results of those two weeks of monitoring are shown in Figure 20.
Figure 20 – Cohesometer readings over the two weeks of monitoring.
V = very good (left), O = OK (middle), N = not good (right)

From Figure 20 one of the most interesting findings was that the students responded as feeling V (very good) or O (ok) for the majority of the time. The categories of V = very good (left), O = OK (middle), N = not good (right) were used as the children did not use the other two categories of quite good and stressed in
the cohesometer.

The results were interesting for the students to see for themselves, as well as the teaching staff, as there seemed to have been a perception that the students were generally not feeling so positive. There were also some specific instances that showed up clearly on the Cohesometer. For example on the Thursday afternoon of the second week (columns in green), there were the highest overall “very good” scores. The students reported this result because they had won the football tournament for their year. Monday afternoons also were both higher in the afternoons than in the mornings. This may be because there was art on Monday afternoons.

For the most part comments were also written by the participants next to the grading they had made on the cohesometer. This provided a clearer picture of the reasons the students may have been feeling the way they were, at the time they recorded their feelings. They recorded such factors as difficulties at home, tiredness, weather conditions and performance anxiety before tests.

7.2.3 Creative Workshops

These workshops were conducted in 2011 and 2012 with children aged 5 -14 years either as an on going weekly after-school activity called “creativity club”, a 3 day holiday program or as a special ‘in school’ art workshop. The aim of these workshops was to explore the creative process in different contexts, with different ages and paradigms.

Creativity Club – This was the after-school club that ran for an hour for over a year. At the beginning of this after school program the children were introduced to the work of Alexander Calder10. This was because he was playful and had created a circus of characters made from wire, corks and other simple everyday objects. The children were asked if they would like to make characters and film their different ideas. They were very enthusiastic and began making similar characters to those of Calder.

10 An American artist who was known for his playfulness and creativity.
After a few sessions, they started to expand upon Calder’s ideas and create their own characters that looked very different. Some children came up with very different and creative ideas, such as jungle scenes and castles.

The children showed a strong preference for working independently from the teacher but enjoyed working together in small teams. They would also move amongst their different groups, giving each other ideas or copying from one person’s idea and then expanding from it as they gained confidence. Some children were more likely to come up with ideas themselves, these children had been described as ‘difficult’ in school. Sometimes they would arrive and be disruptive and were not able to settle until they had found something that engaged them. These children seemed to calm down best when they were on their own and they had the opportunity to ‘play’ with materials that were around them.

They would then take one or two things and start to ‘play’ or manipulate them, eventually coming up with an idea, working with the materials or they would then be settled enough to participate with the other children in their activities.

“My goodness XXXX was in a difficult mood when he arrived. I asked him to go and sit on a chair by himself to try to settle him. As he was sitting there he found some Styrofoam rods and started to play with them. After a few minutes he was like a different boy, totally calm and focused and only wanted to get on with creating something with these newly found rods.”

(Excerpt from field notes, 2011).

These few children who carried the label of ‘difficult’ were very disruptive when they were tired or stressed. But they were nearly always the children that came up with the most novel and creative ideas. The other children watched the children

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11 Disruptive behaviour could be anything from being loud and silly whilst I was talking to throwing material around the room and generally creating havoc in the class. Very often these children needed to move around. They often responded well to having some time on their own in a quiet room with dimmed lights and music.
labelled ‘difficult’ closely as they were often the main initiators of new and interesting ideas.

The children were also very keen to have a non-structured, child-initiated environment in which to explore ideas for themselves. They would use the teacher for technical assistance mainly or to help expand an idea when they were stuck. They were always most engaged when they were left to explore with the materials.

Figure 21. A photo of three boys from the creativity club exploring natural materials. They eventually made a small raft.

Even though many of the children had very full schedules and were often not too keen on school, their parents and some of the children reported a great enthusiasm for the after school creativity club.

“It’s the first day of school and XXXX just came up to me to ask if creativity club is on today and when I said no he asked when we are starting and if we could start as soon as possible.” (Excerpt from field notes, 2012)

Holiday Program – This workshop was held over three days for students from 5 - 11 years of age. The theme of the workshop was Wabi Sabi. On the first day the
The concept of Wabi Sabi was introduced to the children (Reibstein and Young, 2008). The children seemed to get a good basic idea of this quite complex concept:

“It's when something is natural but not perfect. And sometimes it looks really nice”

(Explained by a 9 year old student, 2012)

When the children were taken to the park they were shown some examples of Wabi Sabi and then asked to see if they could find their own. They did an amazing job of finding some lovely examples of Wabi Sabi, such as the patterns on the tree bark or the way that the light fell on the ground through the trees, which showed they had a good grasp of the concept. They were then asked to collect natural objects that they could make something with and given string and scissors. Some children went off on their own to try some things out, others wandered around, seemingly lost as to what to do. They would watch the other children who were ‘playing’ with the materials and then would copy them. But once they had also been “playing’ with the objects for 5-10 minutes, they then seemed to come up with their own independent ideas. Some children worked alone but most chose to work in small groups. Here are some of the things they made:

Figure 22. A small shelter made with sticks and string.
On the second day the children were told about Japanese Tea Ceremonies and were then invited to conduct their own tea ceremony. What was interesting when the children began acting out the tea ceremony was that the formality of bowing and being very aware of their movements actually calmed the children down very quickly. They were not resistant to this formality but seemed to enjoy it.

When the children were taken to the exhibition they were very engaged and very much enjoyed any interactive elements of the exhibition. They also were very keen to make sketches of things that appealed to them and would spend a good 5 minutes in front of an exhibit, sketching it. The children also had the opportunity to enter one of teahouses that the artist had built especially for the exhibition.
They had to climb up a steep wooden ladder to enter this tea house, which again was interesting to observe as the act of concentrating to get into the tea house settled them and they also seemed to have an inherent reverence for the space once they entered it. They lowered their voices and were quieter. They were also very aware of the natural materials that the artist had used to build the teahouse.

The next day the children were then given more materials to create with – plaster, clay, stones and any other natural materials they had gathered over the previous days. They were then asked to create their own Wabi Sabi pieces.

“It seems I am witnessing a similar process as on the first day. Some children start straight away without hesitation, even though the materials are not familiar to them. It is not all the same children but quite a number are the same. The others are watching and somehow wandering around, almost like they are trying to get their bearings before they start.” (Excerpt from field notes, 2012).

For some children they were clearly challenged by the new mediums and gave up. Others persevered and allowed the materials to be a part of the creative process, as well the creative process itself.

“XXXX just let her piece fall in the sand and was devastated at first but then she saw that the effect was quite interesting and called out to me – Look Ms Deininger, real Wabi Sabi!” (Excerpt from field notes, 2012).

Figure 25. The Wabi sabi piece that fell in the sand.
“Special Art Project” – This workshop was named “Asian Art” and was aimed at exposing the secondary students to the art and philosophy of Chinese ink as part of special Art week in school. At the beginning of the workshop students were asked to keep an art diary of their impressions and thoughts over the next three days. The children made the diary as they wished. They took quite a lot of time and care making this diary and there was quite a range of different formats made. Figure 26 shows an example of some of the diaries that were made by the children.

![Diaries made by children](image)

Figure 26. Some of the diaries that were made.

On the first day the children were given charcoal and asked to play with the charcoal. There were regular ‘meetings’ to reflect on the process. The students were enthusiastic and willing to try out this new medium. Their reflection was quite insightful at times:

“I like this piece because it somehow reflects me, it’s strong and has lots of expression.” (Comment from 14-year-old student)

They were very positive about being able to simply ‘play’ with the medium, rather than being told how to use it. In the ‘chats’ the students shared how they had come to different styles and methods of using the charcoal.
On the second day the students were introduced to Chinese ink and how the ink was used in China and Japan over history. They spent the day working with the Chinese ink, first only in black and white but later in colour as well. They had an interesting observation about working in black and white and then moving to colour:

“The black and white was starting to make me feel depressed.” (13-year-old student)

“Yeah, I felt kind of sad and kind of like I couldn’t really express myself properly.” (12-year-old student)

“When we started to use colour I felt myself feeling happier, freer like I was alive again – a bit.” (11-year-old student)

(Excerpts from group interview, 2012)

The students were also shown a very large brush that I own and used in my work. They were very excited to have the opportunity to use this brush. They were curious about what the experience would be like.

On the third day the students were taken out to the neighbouring park to experience being out in nature and painting. Some of the students chose to work in small groups, painting a similar landscape, while others were happier to work alone. They reported that they liked that they could paint what they wanted. They were also going to have the opportunity to be able to use the large brush to create a large joint canvas to be shown in a school art exhibition. They painted the joint piece in a supportive cooperative way, giving mostly positive feedback. They also liked very much having unstructured time to be outside and painting what and when they wanted to. Some students wandered around and did very little in the way of painting, others sat down and worked independently and created quite a number of art pieces.

There was very little copying in this group, mostly they showed interest in other’s work but liked to then create something that they felt reflected them.
The students wrote in their diaries at the end of each day. Some children found putting down their thoughts more difficult. But for others they wrote a great deal, often they wrote about more personal issues than just about what they had done and what they were learning in the workshop:

“It was interesting to be able to use colour, but also use black and white as a mix in which I could find myself very easy. It helped me find myself and also gave me a feeling of freedom and opportunities.”
(Excerpt from a 12 year old girl)

“I find the free play way more interesting and I had more fun in this exercise. I could feel the power and strongness just flow who’s inside in me. It was more free.”
(Excerpt from a 13 year old boy)

On the whole the students reported that they enjoyed the workshop, they liked most the fact that they had unstructured time and were free to create what they wanted to. They also enjoyed working with the large brush.

“I liked to draw with the gigantic brush. It was a very cool feeling. I enjoyed all the three days and I liked to learn all the drawings.”
(Excerpt from an 11 year old boy)
7.2.4  Play and prototyping

This study builds on existing research into the benefits and limitations of prototyping and starts to explore whether play supports creativity and divergent thinking. Two workshops were held with twenty postgraduate students from the Cardiff School of Art and Design. The first workshop looked at the concept and perception of play. The participants were asked to list words that they felt represented play.

The results of this first workshop found that the four most playful activities rated by the students were: making/constructing, art experiments, banter and socializing. What is interesting from these top four activities is that they are both social and individual. In addition, three out of the four activities are closely related to the role of prototyping. These findings differ slightly from the findings of Holmes (1999) that emphasized the social element, but was in line with Holmes’s findings that “an activity is considered to be playful when one has an opportunity to express oneself in creative, relatively unregulated ways.”
The findings also link with the work done by Brown and Vaughan (2010) where they describe play as having the following attributes:

- It is purposeless and done for its own sake.
- It is voluntary.
- Play possesses an inherent attraction—you don’t play to reach some other end, it is an end in itself.
- Lowers self-consciousness.

The second workshop looked at the effect of playfulness on creative performance. Participants were asked to complete two very quick sketches - one with eyes open and one with eyes closed. On completion of both tasks all the images generated by the students were laid out on two large tables for evaluation. An example of one of the images drawn with eyes open is shown in figure 28.

![Figure 28. Drawing with the eyes open.](image)

An example of one of the images drawn (by the same person), when eyes were closed, is shown in figure 29.

![Figure 29. Drawing with the eyes closed of two people embracing.](image)
All 200 images from the first task (with eyes open) were put on one table and all the 200 images from the second task (with eyes closed) were put on another. All the students were then asked to look through both sets of images and see if there were any differences between the two.

The participants then decided which drawings they found more appealing in a creative sense. From the participants qualitative evaluation the majority of the drawings carried out when the students had their eyes closed, were judged as being more novel and as a result more appealing than the drawings done when they had had their eyes open. This links to a common definition of creativity that emphasizes the importance of novelty (Sternberg, 1999; Boden 2004).

7.3 Quantitative Studies results

7.3.1 Play and creativity
This study was designed to explore whether play supports creative problem solving, to explore four different forms of play and if the form of play is a factor in the creative problem solving. Duncker's candle problem (1945) was used as the creative problem solving challenge. Fifty students were divided into for the five different conditions: non-related play, social play, imaginative play, physical play and no play. They were asked to solve the Duncker’s candle problem where they are given a box of matches, some drawing pins and a candle and they are asked to find a way to attach it to a cork board so that the wax from the candle does not drip onto the table.

Figure 30 below shows an example of one participant’s correct solution. Figure 31 shows an example of another participant’s incorrect solution.
The solution that was written here is: Empty matches, pin box to wall. Put candle on box.

In terms of the ‘Social Play’ condition only a limited amount of conversation took place on the Facebook application. See Figure 32 below. Some ideas were shared on how to solve the problem.
It was observed that participants were also using the Facebook application for their own personal use. It was reported by some participants that there was not enough time to use the Facebook application effectively.

Figure 32. The Facebook conversation amongst participants in the ‘Social Play’ condition
Figure 33 below shows the overall number of correct solutions for each condition. The ‘Non-Related Play’ condition and the ‘Social Play’ condition had the highest number of correct solutions (6 out of 10). The ‘Physical Play’ condition had the next highest number of successful solutions (4 out of 10), followed by the ‘No Play’ control condition (3 out of 10) and then finally the ‘Imaginary Play’ condition (1 out of 10).

![Bar chart showing number of correct solutions for each condition](image)

**Play Conditions**

Figure 33. The number of correct solutions for each condition.

Figure 34 below shows the average completion times, in seconds, (including 95% confidence intervals) for each condition. The results show that on average, participants in the ‘Non-Related Play’ condition had shorter completion times ($M = 141, SD = 31$) than participants in the ‘No Play’ condition ($M = 233, SD = 74$), the ‘Imaginary Play’ condition ($M = 270, SD = 51$), the ‘Physical Play’ condition ($M = 252, SD = 101$), and the ‘Social Play’ condition ($M = 252, SD = 79$).
The completion times were analysed using a univariate analysis of variance. There was a significant effect of condition, $F(4,45)=5.17$, $p=0.002$. The completion times were analysed between two conditions at a time. Note that an alpha level of 0.05 was used for all statistical tests. Table 3 shows that there were significant differences between the ‘Non-Related Play’ condition and all other conditions.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>F-test Statistic (F values)</th>
<th>Statistical Significance (p values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Play</td>
<td>14.00</td>
<td>0.002</td>
</tr>
<tr>
<td>Imaginary Play</td>
<td>46.60</td>
<td>0.000</td>
</tr>
<tr>
<td>Physical Play</td>
<td>10.99</td>
<td>0.004</td>
</tr>
<tr>
<td>Social Play</td>
<td>17.09</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Table 3. Significance of differences between completion times of ‘Non-Related’ Play condition with other conditions.
7.3.2 Study of modal preferences and creativity
This study was aimed at exploring natural preferences by asking whether the adults preferred playing with objects on a computer screen to solve a creative puzzle or by solving the puzzle ‘in their heads’. Sixty participants were asked individually to sit in front of a computer monitor where they were presented with a puzzle on the screen. The puzzle that was used was a De Bono lateral thinking puzzle (1977). There were three shapes, which were two-dimensional and participants were instructed to create a shape that looks three dimensional from these three individual shapes. In three out of the four conditions the participants were able to choose whether they wanted to ‘play’ (by using the mouse to move the shapes) or think to solve the puzzle. Conditions 3 and 4 were added as there was an issue with the software program. Also the participants in condition 1 and 2 were from the design department and seemed to be quite familiar with these types of puzzles, therefore the participants from condition 3 and 4 were from more varied backgrounds.

Below in Table 4 there is the percentage of the modal preference chosen by the participants. Please note that in condition 2 the participants were not given the choice until after they had solved the puzzle using the ‘thinking’ mode.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Play Mode preference</th>
<th>Puzzle Solved</th>
<th>Think Mode preference</th>
<th>Puzzle Solved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>93.75</td>
<td>86.7</td>
<td>6.25</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
<td>n/a*</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>81.25</td>
<td>84.6</td>
<td>18.75</td>
<td>66.7</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>66.7</td>
<td>20</td>
<td>33.3</td>
</tr>
</tbody>
</table>

Table 4: Percentage of participant’s modal preference and their performance across the four conditions. There were 15 participants per condition.
* Participants in this condition were unable to choose this mode to solve the puzzle, they could only state their preference after they had completed the task.
Overall:
Of the people who had a choice, 85% chose to play.
95% said they would have preferred to have the ‘real’ shapes to the other two options of solving the puzzle.

7.3.3 Correlation between Mental States and Creativity

The aim of this study was to explore Wallas’s (1926) second form of incubation, i.e. “relaxation from all conscious mental work” in relation to creativity by following a methodology similar to Experiment 1 of the work of Dijksterhuis and Meurs (2006). “Relaxation from all conscious mental work” was referred to in this study as “mental relaxation” and was the third condition of the study. Participants were randomly assigned to one of three conditions: an immediate generation condition, a conscious thought condition, and a mental relaxation condition, with 16 students per condition. In the instructions, five examples of existing pasta names were listed, all ending with the letter “i”. Participants were asked to generate new names for pastas. The participants were hooked up to a monitoring device that recorded their Heart Rate Variability (HRV).

Divergent Thinking Results

Data from one participant who took part in the study had to be removed from the analysis because there was an error in the coherence measurements from the HRV recording equipment. This participant was in the conscious thought condition. Table 5 shows the mean number of pasta names created by the participants for each condition that ended in the letter “i” (converging items) and those that did not (diverging items). Standard deviations are given in the brackets.

---

12 This following section becomes very mathematical and heavy on statistics. In order for this section to be more understandable it may be important at this point to explain some of these terms. When you see $M = (a\text{ number}), SD = (another\text{ number})$, $M$ is the overall average and $SD$ is the standard deviation, which means how much the individual scores varied from the average. So when the SD is quite high then there is a lot of variation from the average.
Table 5 also suggests that there is a difference between the ratio of the mean number of converging words to the mean number of divergent words for the three different conditions. To explore this further, the ratios between the number of divergent words and convergent words, for each participant were calculated using the formula below:

$$\text{Word Ratio} = \frac{Nd}{Nc + 1}$$

Where Nd is the number of divergent words and Nc is the number of convergent words. One convergent word was added for each participant (irrespective of condition) to avoid having a zero in the denominator, i.e. for those participants who gave zero convergent words.

Figure 35 below shows the mean word ratio values (including 95% confidence intervals) for each condition. The results show that on average, participants in the mental relaxation condition had higher Word Ratio values ($M = 1.58, SD = 2.01$) than participants in the conscious thought condition ($M = 0.58, SD = 0.65$) and the immediate condition ($M = 0.82, SD = 0.95$).
Figure 35. The mean word ratio values for each condition, including 95% confidence intervals.

To analyse the results further a 3 (Condition: Immediate generation vs. conscious thought vs. Mental relaxation) x 1 (word ratios) univariate analysis of variance (ANOVA)\textsuperscript{13} was used. Note that the alpha level was set at 0.05 for significant differences, however an alpha level of 0.10 was accepted as being of marginal significance. The analysis showed that the main effect for condition was marginally significant, \(F(2, 44) = 2.38, p = 0.10\).

To compare conditions, three separate 2 (two of the three conditions) x 1 (word ratios) ANOVAs were undertaken. The comparison between the immediate and conscious thought conditions showed that there was no significant difference between the conditions, \(F(1,29) = 0.66, p = 0.42\).\textsuperscript{14} The comparison between the conscious thought and mental relaxation conditions showed that there was a marginally significant difference between the conditions, \(F(1,29) = 3.40, p = 0.08\).

\textsuperscript{13} This is a statistical application that allows one to see if the conditions are significantly different from one another.
\textsuperscript{14} \(F\) is the value from the analysis of variance and \(p\) is the probability that this happened by chance. So if \(p\) is < .05 then it is said that there is probably an affect of the condition occurring and if \(p>.05\) then it is probably just chance.
The comparison between the immediate and mental relaxation conditions showed that there was no significant difference between the conditions, $F(1,30) = 1.90, p = 0.18$.

**CAT Results**

All the pasta names generated by the participants were scored on their level of creativity by three independent professional designers who were blind to the purpose of the experiment and blind to each other’s scores. They used a 5-point scale ranging from 1 (not at all creative) to 5 (very creative). The scores for each pasta name (from the three independent designers) were averaged. The overall mean creativity scores for each condition are shown in Table 6 below. Standard deviations (across participants within a condition) are given in the brackets.

<table>
<thead>
<tr>
<th></th>
<th>Immediate</th>
<th>Conscious Thought</th>
<th>Mental Relaxation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.24 (0.40)</td>
<td>2.25 (0.31)</td>
<td>2.36 (0.35)</td>
</tr>
</tbody>
</table>

Table 6. Mean Creativity Scores

The results showed that on average, the creativity scores were higher in the relaxation condition when compared with the other two conditions. However, the main effect for condition was not significant, $F(2, 44) = 0.67, p = 0.52$.

**Multimodal Assessment**

To compare conditions when combining word ratio and CAT measures, three separate 2 (two of the three conditions) x 2 (word ratios and CAT measures) multivariate ANOVAs were undertaken. The comparison between the immediate and conscious thought conditions showed that there was no significant difference between the conditions, $F(1,29) = 0.34, p = 0.71$. The comparison between the conscious thought and mental relaxation conditions showed that there was a significant difference between the conditions, $F(1,29) = 3.81, p = 0.03$. 
The comparison between the immediate and mental relaxation conditions showed that there was no significant difference between the conditions, $F(1,30) = 2.11, p = 0.14$.

**Coherence and Creativity**

The HRV coherence values for each participant were recorded every second by the HRV recording equipment and automatically categorized as having low (0), mid (1), or high (2) coherence by the HRV analysis software emWave Desktop (2011). Therefore a person in high coherence throughout a minute period would have an overall coherence value of 120; a person in mid level coherence would have a value of 60; and a person in low coherence would have a value of zero. In figures 36 and 37 respectively, an example of readings using Emwave© software, of a person in low coherence (predominantly) and in high coherence are shown.

![Figure 36](image)

*Figure 36. An example showing a person who is in low coherence (predominantly).*
The mean coherence values (over a minute period) are shown in Table 7. Standard deviations (across participants within a condition) are in the brackets. The first row shows the mean coherence values for participants (per minute) for both the 3-minute conscious thinking condition and the 3-minute mental relaxation condition. The second row shows the mean coherence values for participants for the 1-minute task.

<table>
<thead>
<tr>
<th></th>
<th>Immediate</th>
<th>Conscious Thought</th>
<th>Mental Relaxation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 min mental state (C3)</td>
<td>-</td>
<td>24.6 (19.0)</td>
<td>33.7 (24.7)</td>
</tr>
<tr>
<td>1 min Task (C1)</td>
<td>31.0 (32.4)</td>
<td>16.2 (19.5)</td>
<td>10.7 (13.6)</td>
</tr>
</tbody>
</table>

Table 7. Mean Coherence Values (per minute).
To compare conditions, three separate 2 (two of the three conditions) x 1 (1-minute task HRV coherence values) ANOVAs were undertaken. The comparison between the immediate and mental relaxation condition showed that there was a significant difference between the conditions, $F(1,30) = 3.39, p = 0.03$. The comparison between the conscious thought and mental relaxation conditions showed that there was no significant difference between the conditions, $F(1,29) = 0.84, p = 0.37$. The comparison between the immediate and conscious thought conditions showed that there was no significant difference between the conditions, $F(1,29) = 2.34, p = 0.14$.

The HRV coherence values in the 3-minute mental state were also analysed for the conscious thought and the mental relaxation conditions. The comparison between the conscious thought and mental relaxation conditions showed that there was no significant difference between the conditions, $F(1,30) = 1.28, p = 0.27$.

Table 7 also suggests that there is a difference between the mean coherence values of the 3-minute mental state and the 1-minute task for the conscious thought and mental relaxation conditions. To explore this further, the differences between the coherence measures, for each participant, were calculated using the formula below:

\[ \text{Change of State (CoS)} = C_3 - C_1 \]

Where $C_3$ is the average coherence value for a participant (per minute) for the 3-minute mental state and $C_1$ is the average coherence value for a participant for the 1-minute task.

Figure 36 shows the average Change of State (CoS) values for the conscious thought and mental relaxation conditions, including 95% confidence intervals. The CoS scores were analysed using an independent t-test$^{15}$ comparing the conscious thought and mental relaxation conditions. The results showed that on

$^{15}$ A t test was used this time as it allows one to look at a direction of an affect. In this case the change of state was expected to move in one direction – either there were more changes of state or not.
average, participants in the mental relaxation condition had higher CoS values ($M = 23.0, SD = 24.1$) than participants in the conscious thought condition ($M = 8.4, SD = 24.9$). This difference was marginally significant, $t(29) = -1.66, p = 0.05$ (one-tailed), $r = 0.29$.

Figure 38. The mean Change of State (CoS) values including 95% confidence intervals.

7.3.4 Dynamic movement within State of Being

This study was set up as a follow on from the previous study. Twenty-one participants were given training on how to obtain high coherence values. During this training, the participants were asked what strategies they used to go into a high coherent state. The Coherence Coach was used for all the participants, most of whom reported that it was helpful but in different ways. Some reported that they relaxed best by watching the wave movement of the programme, others said the music helped them to relax and move into high coherence.
Strategies that were used by the participants were:

- Nearly all of the participants used concentrating on their breath or deep breathing to move into a coherent state.
- Some used visualization of something that made them feel good to help them move into higher coherence.
- Some closed their eyes and just focused on the music.
- One participant found the music disturbing, she preferred just having the wave movement without any sound.

Of the twenty-one participants, we were only able to use 16, as the other 5 were unable to move themselves into a coherent state before the actual task. The task was to create novel names for pasta after being given examples of pasta names ending in 'i'. Each participant's HRV coherence was monitored over the one minute task. An analysis was carried out looking at the change of state as seen in the coherence readings. There were three conditions being looked at:

- no change of state – this is when a participant stayed in the same coherent state for the whole of the task.
- 1 change of state – this is when a participant moved from one coherent state to another.
- 2 changes of state – this is when a participant changed their coherent state more than once.

An analysis of the 16 participants based upon the above three conditions showed the following:

1. No changes in state: 1 person
2. 1 change in state: 8 people
3. 2 changes in state: 7 people

Figure 39 below shows the mean word ratio values (including 95% confidence intervals) for each condition (Conditions: two changes of state vs. one change of state vs. no change of state).
The results show that on average, participants with two changes of state had higher Word Ratio values \( (M = 1.54, SD = 1.72) \) than participants with one change of state \( (M = 0.17, SD = 0.23) \) or no changes of state \( (M = 0.00, SD = 0.00) \).

![Graph showing word ratio values for different changes of state](image)

Figure 39. The mean word ratio values for different changes of state, including 95% confidence intervals.

To analyse the results further a univariate analysis of variance (ANOVA) \( 2 \) (Condition: two changes of state vs. one or no changes of state) x 1 (word ratios) was used. Note that the alpha level was set at 0.05 for significant differences, however an alpha level of 0.10 was accepted as being of marginal significance. The analysis showed that the main effect for condition was significant, \( F(1, 14) = 5.85, p = 0.03 \).

**CAT Results**

Figure 40 below shows the mean CAT\textsuperscript{16} values (including 95% confidence

\textsuperscript{16} This is the score given by independent experts who judeg the results for creativity.
intervals) for each condition (Condition: two changes of state vs. one change of state vs. no change of state). The results show that on average, participants with two changes of state had lower CAT values ($M = 7.53$, $SD = 1.43$) compared to participants with one change of state ($M = 7.71$, $SD = 1.80$) but higher than the one participant with no changes of state ($M = 4.00$, $SD = 0.00$).

![Figure 40](image-url)

Figure 40. The mean CAT values for different changes of state, including 95% confidence intervals.

To analyse the results further a 2 (Condition: two changes of state vs. one or no changes of state) x 1 (CAT measure) univariate analysis of variance (ANOVA) was used. The main effect for condition was not significant, $F(1, 14) = 0.06$, $p = 0.81$.

**Multimodal Assessment**

To compare conditions when combining word ratio and CAT measures, a 2 (Condition: two changes of state vs. one or no changes of state) x 2 (word ratios and CAT measures) multivariate analysis of variance (ANOVA) was used. The analysis showed that the main effect for condition was marginally significant, $F(1, 14) = 3.06$, $p = 0.08$. 

![Diagram](image-url)
Chapter 8 Discussion

8.1 Introduction

At the beginning of this chapter I will continue to use the structure that I have used in the methodology and results section; to look at each study individually, drawing out the implications of the findings and looking at the limitations. This format seems to me to be the clearest way of presenting the large and diverse amount of information inherent in this multi-study. Once the implications and limitations of each study have been clearly stated, I will then start to synthesize the findings to start to form a more cohesive, overall picture of the contribution this series of studies is making to creativity research, which will then lead to the conclusions in Chapter 9.

8.2 Implications of findings

8.2.1 Fascinating Journey

Sometimes time stood still, at other times it sped up. Insights came spontaneously and my meandering through vastly different contexts led me to unusual connections. One of the most important elements of this dance was to simply go with it. To be open to moving in directions without thinking about it beforehand, just going with the ‘flow’ (as Csikszentmihalyi would possibly say). This openness was an important prerequisite to the ‘dance’ of the creative process as I observed it within myself.

When the ‘dance’ is coupled with the multitude of different factors pointed out in this study, factors that played an integral role in the creative process, it became clear that creativity is a complex phenomenon. Taking the insights that have been attained in this narrative self-study and juxtaposing them against the history of creativity research, it also becomes clear that there is still a great deal to be explored in this area. Many of the aspects pointed out in this study require a great deal more research to gain a better understanding of the role that they play in the creative process. Not only do the individual factors need to be explored at greater
depth, the actual movement and interrelation of these factors need to be looked at further as well.

In the scientific circles Bohr points out: “it is the entire phenomenon in which the measurement takes place. It is not just the observed particle, the incident electron, the microscope and the plate at which the spot Q appears. It is rather the form of the experimental conditions and the content of the experimental results as a whole that are meaningful” (Talbot, 1996). I believe that this also applies to the creative process and creativity research.

It is not just these individual factors pointed out in this study and others, that are important to the creative process, it is the interaction between them and the 'dance' of these factors as a whole. This is why the self-study methodology was an appropriate and powerful method of researching this particular subject. It allowed for the observation of the creative process within myself, which in turn gave insight into the organic unfolding that had taken place during that process.

Just as with a dance, it is not just the dance steps or the dancers, it is how everything comes together as a whole. The complexity of each dance step, the relational interaction between the dancer, the dance, the audience and the greater environment, are all part of this extraordinary phenomena we call the creative process. Such an important insight may not have come about if it had not been conducted as a self-study through narrative inquiry but rather as a more conservative “objective” qualitative or quantitative study.

Another important finding of this study was the similarity of the process for the two very different fields – research and art. It has been shown before that scientists have used a similar creative approach to artists, when working with a particular problem (Csikszentmihalyi, 1996; Policastro and Gardner, 1999). What may not have been done before is that the creative process was carried out and studied by the same person in both the scientific and in the art realms.
What this study may indicate is that the creative process may be more prolific than is currently the common perception. It could be that the creative process is not just relegated to the geniuses, the lunatics and the gods. It may be that we are all capable of incorporating creativity into our own lives, whether we are an artist, a fish fryer, a customs officer or a neurosurgeon. It also seems very important to point out that creativity is not necessarily a tick list of items that need to be met, but more to do with the process and the interplay of factors within that process.

This interplay of factors could also be described as a movement that is responsive to the internal and external forces that play on it. This could be called a dynamic movement. The multitudes of factors were important in that they described the conditions that exercised influence on me as an artist and person. These factors affected my internal state, which then affected how I approached perceiving these factors and the environment around me. Therefore my ‘state of being’ very much affected how creative or open I was to the art or the research.

8.2.2 Cohesive Classroom

The results from this study led to some important areas to be highlighted and discussed. These fall under the following categories; stress factors within a classroom environment, reflections for further study and possible directions for curriculum development and learning preferences of individuals.

Stress Factors within the Classroom

From the observations, conferencing, the Cohesometer and interviews, there were a number of factors that were consistently reported by members of the class as increasing their stress levels and therefore their non-cohesiveness. Some of these factors were unable to be changed, as they were due to personal factors or were simply a part of life. However having an awareness of such factors; as difficulties at home, tiredness, weather conditions and performance anxiety before tests, led to a feeling of empathy. This understanding of one another then seemed to create more cohesiveness within the class.
The children reported that they could understand better why someone was behaving the way they were. The teachers also said it helped them as sometimes the behaviour of the students was not a reaction to their teaching but something completely personal or independent from them. (From field notes).

Others factors that fell under the category of “possibly being alleviated” were such things as the physical layout of the classroom, the size of the classes or groups within the classroom, the noise level in the classroom, time pressure and emphasis on bad behaviour. The students and teaching staff expressed a belief that if some of these factors were changed then there would be a reduction in the stress levels within the classroom.

In looking further into research of stress in children, particularly in an educational setting there seems to be very little published about this subject. The majority of the studies are either about extreme, traumatic stress (Shakoor and Chalmers, 1991) or prenatal stress in relation to learning (Lemaire, 2000). This may be an area for further research as the affects of stress on academic performance in children seems to be quite a neglected area of research to date.

**Awareness of Class Structure**

Individual interviews were held with the teaching staff of the class. In these interviews the findings from the learning styles and Brain Dominance Profiles were shared and reviewed. The teachers responded to this feedback by changing the classroom layout, reinforcing positive behaviour more and implementing strategies to help students’ transition better.

These measures helped to reduce the stress in the classroom. The teaching staff also reported that they had a better understanding of what stressed the children, which in turn helped them in their class management.
Both members of the teaching staff also saw that by focusing more clearly on positive reinforcement methods they were encouraging a clearer understanding of the positive behaviour that was expected of the class. This became the first step in giving the students an opportunity to take more responsibility for their own behaviour. The children responded positively to these changes.

**Learning Preferences of Individuals**

From the results, it was shown that there was a large majority of the students who reported that they preferred to learn more by a tactile/kinaesthetic modality. This was such a strong majority that it warranted further investigation. In speaking to professionals that are regularly testing for learning preferences, they reported that this sort of percentage (70-80% preferring the Tactile/Kinaesthetic mode) was quite common. (Interview with “lerntrainerin”, April, 2011, Deininger et.al, 2012).

This was not to say that other modalities were ineffective within the classroom. It was reported by the students that their stress level was lower and they were more engaged in the lesson when they were able to receive information via their preferred modality. There have been numerous studies on the efficacy of teaching students through their preferred method of learning, with mixed results (De Bello, 1990). Other studies have shown that there is a correlation but it is very difficult and sometimes even impractical to try to integrate this into a classroom setting (Felder and Silverman, 1988). The majority of the studies however conclude that a multi-modal form of learning was the optimal way to deliver information (Boström and Lassen, 2006).

What was also interesting from this study was that the students were genuinely interested in what their preferred mode of learning was. The sheer knowing of their natural learning style seemed to have an affect on how engaged they were in learning. They also expressed the desire to be able to learn more “their natural way”. These elements of understanding a preferred style of learning and being able to play an active role in self-regulating the learning has been shown to have a positive effect upon academic performance (Pindrich and De Groot, 1990).

There has been little research into the role learning preferences play on the levels of stress associated with learning, particularly in the primary school age group.
Reflections for further study and possible directions for curriculum development.

One of the most striking and consistent findings in this study was the affect of "chill out time" and the importance of individual autonomic expression. This showed up consistently in many instances; self-reporting, group discussions, observations in the Cohesometer and even as a motivational tool for the students. This would suggest to teachers and developers of curriculum that situations where the students have the opportunity to have individual, relatively unstructured time is a very important area to be considered. It is also interesting to note that in other studies (Osborne, 1969; Hoffman, 2009) free time was so important that it could also be used as positive reinforcement. This was also the case in this study. Examining why free time is so important to the students could also elicit some interesting insights into what motivates children especially in an educational setting. As an aside it must be pointed out that the 'chill out' time' for the teachers was often as important if the stress levels were relatively high that day.

This very consistent and very clear observation evoked a deeper look at 'chill out time'. In reflecting on the nature of this chill-out time, it became clear that an important aspect was the element of self-determination. Self-determination and intrinsic motivation has been shown to be an important motivational factor among company employees worldwide (Pink, 2010; Ryan and Deci, 2000a). This factor has also been shown in school settings (Dweck, 1986). Providing the opportunity for children to exercise their own autonomy within an educational setting would appear to be a rising issue that should be addressed.

8.2.3 Creative Workshops

From the three different workshops the most common elements that emerged were that of: the importance of play in the creative process, the non linear unfolding of the creative process, the opportunity to independently explore and awareness of ones-self in the creative process.
Play showed up to be very important for all the age groups and in each of the different settings. Play was important in building a relationship with the external material. This seems to be in line with what Winnicott (1971) was talking about at a very fundamental level, where a baby builds an external relationship with something other than itself. This relationship was not only a fundamental drive but also a way of understanding the material, exploring what it could do and not do. The element of play also appeared to affect the ‘state of being’ for the children, more often than not the children appeared to enter a more cohesive state after they had had time to play with the materials. Brown and Vaughan (2010) explored this idea of play bringing one into a particular state in their book called Play. Gordon and Esbjörn-Hargens (2007) also talk about play as being an important element of one’s well-being and actually being able to have a transformative effect.

What was also interesting to observe from these three workshops was to see the children ‘meandering’ as I had often found myself doing. The children often moved from one thing to another with no immediate connection apparent but often they then found a connection. An example of this would be in the Wabi Sabi workshop, many children started making a fishing rod with a stick and string. But then they would start to gather other materials or wander around with their fishing rod, almost like they were ‘fishing for ideas’. Many of the ‘fishing rod gang’ then went on to make completely unrelated things like a crown or a set of swings, the only common element being the sticks and string. The non-linear meandering was very often witnessed in the last year in the creativity club and led to a number of wonderful discoveries and creations.

This non-linear movement was mainly possible and occurred because the children were given the space and the possibility to move in this way. Throughout these workshops, the students were given many opportunities to explore as they wished. There was very little direction given once it came to producing of an artefact, idea or painting. This freedom to explore also seemed to have an affect on the children’s ‘state of being’. Many children reported this:

‘I love that we can just do what we want – that is so cool!’ (excerpt from field notes 2012)
This experience of freedom to explore in their own natural way and by not having goals, the children were incredibly engaged in whatever they were doing. The idea of intrinsic motivation and self determination as having a positive affect on one’s ‘state of being’ has also been shown in adults in their work environment (Ryan and Deci, 2000; Hennessey and Amabile, 1998).

Perhaps another important element of self-determination that showed up in this series of workshops was self-reflection or being aware of oneself. In all three workshops there was an element of self-reflection, either in how the creative process was unfolding (through the art diaries), understanding how one felt (in the Japanese tea ceremony) or reflecting on the ideas that one wanted to execute (often in discussions in the creativity club). This element of reflecting internally about the often-external process of creating is highlighted by a number of creativity theorists (Bohm and Peat, 1987; Gardner, 1993, Hermann, 1999, Fitzsimmons, 2012).

It is also interesting to note that quite a number of children who were often labeled as ‘difficult’ were often often the children that came up with the most novel and creative ideas in these workshops. The other children also watched the children labelled ‘difficult’ closely as they were often the main initiators of new and interesting ideas. These “difficult children” also responded incredibly well to having autonomy and the opportunity to play with materials. They often also needed to understand why they were doing a particular task. It was as though they needed a context upon which to build their knowledge. The children in the cohesive classroom (which was seen as a ‘difficult class’) also responded very well to the unstructured, self determined chill out time where they could express themselves creatively.

8.2.4 Play and prototyping

The four most playful activities rated by the University students were making/constructing, art experiments, banter and socializing. What is interesting about these top four activities is that they are both social and individual. This has been observed in the children as well in the creative workshops. They enjoyed
working in small groups sometimes and then by themselves at others. I have observed this in myself as well as in others, at times it is important to run ideas past someone else or to work on a project with another person who has other experiences. This can be incredibly fruitful to the creative process. At other times it is incredibly important to have time to oneself to be introspective or simply to have more mental space to explore. Gordon and Esbjörn-Hargens (2007) incorporate the individual and the social aspects of play into their integral model of play on a number of fascinating levels, showing that these two dimensions of play: the individual and the social are naturally part of play.

In the second workshop the participants were asked to draw with their eyes open and then their eyes closed and then judge what they had produced in terms of creativity. If it is the case that the drawings done by the students were more creative when they had their eyes closed compared to when they had their eyes open, then it is interesting to explore why that might be. One possible reason is the element of self-judgment. When students had their eyes open, they could see what they were drawing and could therefore evaluate and judge their own work more easily and possibly censor their drawings as they were doing them, to make the drawings more of a convergent nature. When they had their eyes closed self-judgment was not so easy (even though some reported being fearful of producing poor work when they had their eyes closed). One key aspect of play is the removal of constraint including emotional and intellectual constraint (Gordon, 2008). So perhaps one could argue that there was a higher element of play when the students had their eyes closed for the second task, and as a result, were more creative.

8.2.5 Play and creativity

After analysing the results of this study it is clear that the ‘Imaginary Play’ condition had the lowest performance both in correct solutions and completion time in relation to the ‘No Play’ condition. There is no clear indication as to why this may be the case. One possibility could be that the story did not clearly communicate the task. Another reason could be that there was a large amount of text to read, which may have been strenuous for some students. The ‘Physical Play’ condition had a higher number of correct solutions and a longer average
completion time in relation to the ‘No Play’ condition. Even though the number of correct solutions was higher than the ‘No Play’ condition it was only marginal. This condition is closest to a prototyping process therefore it was somewhat surprising that there was only a marginal difference in performance, in relation to the ‘No Play’ condition. Prototyping is largely regarded as one of the fundamental elements of the design innovation process therefore we would have expected a much higher number of correct solutions (Kelley and Littman, 2002).

The ‘Social Play’ condition had a higher number of correct solutions and a longer average completion time in relation to the ‘No Play’ condition. This was not expected, as there was only a limited amount of interaction through the Facebook page. It had also been observed that by going onto their personal Facebook pages the participants were distracted. Perhaps this distraction was also a factor in the creative problem solving performance. Wallas (1926) and more recently Dijksterhuis and Meur (2006) have established that the element of distraction can have a positive effect upon creativity. It could also then be said that this form of distraction may be another type of non-related play.

A surprising result was that the ‘Non-Related Play’ condition had a higher number of correct solutions and a much shorter average completion time, in relation to the ‘No Play’ condition. The question is why? Brown and Vaughan (2010) and Csikszentmihalyi (1996) have touched on the idea that play may be linked to an altered state. From the definition of ‘flow’ there seem to be three particular aspects that are present in the ‘Non-Related Play’ condition. These are: there was no worry of failure; self-consciousness disappeared; and the activity was enjoyable. What may be emerging is that the non-related play activity was not only enjoyable but was free of performance expectations. Deci and Ryan (1985) suggests, “that the concept of flow represents a descriptive dimension that may signify some of the purer instances of intrinsic motivation.” To be truly intrinsically motivated a person must also feel free from pressures, such as rewards or contingencies.
“The concept of intrinsic motivation is simply another way of saying that people are interested and enjoy what they are doing” (Cameron, 2006). The controlling nature of extrinsic motivation has been found to be detrimental to creativity (Amabile, 1996). It has also been suggested that intrinsic motivation occurs when action is experienced as autonomous or self-determining (Deci & Ryan, 1985). It would seem that non-related play displayed the characteristics that define an intrinsically motivated activity.

If we look at both the ‘Non-Related Play’ and the ‘Social Play’ conditions, both exhibited an element of autonomy because they were not related to the task at hand. This autonomous element has often been related to prototyping exploration (Schrage, 1999). However, researchers have also found a link between autonomy and overall well-being (Pink, 2009). This would suggest that autonomy could also be related to the ‘state of being’ of the person carrying out the creative task. In previous studies it was found that ‘state of being’ does play a role in the creative process (Section 6.3.4 and 7.3.3). ‘State of being’ seems to be more of a factor in this study than prototyping itself. The findings of this study seem to suggest that a non-causal relationship is having a greater affect upon the creative process than a causal one.

**8.2.6 Study of modal preferences and creativity**

In all conditions there was an overwhelming preference of participants to want to use manipulation (play condition) as shown in Table 4 (section 7.3.2). According to Slovic “The expression of preference by means of choice and decision making is the essence of intelligent, purposeful behaviour “ (1995. pp.364). What is this overwhelming preference to manipulate the shapes via a computer mouse telling us? It seems to be informing us that our natural tendency is to interact, even indirectly; with the world we are in. “Biological brains are first and foremost the control systems for biological bodies. Biological bodies move and act in rich real-world surroundings” (Clark, 1998. pp.506). In this study the bodily information was not directly related to the problem solving of this creative task, i.e. the participants did not manipulate the actual physical shapes. There was, however,
secondary visual feedback that was informing the participant as they tried to solve the task.

Contemporary embodied cognition theorists have categorized personal experience into two areas: on-line and off-line embodied cognition. On-line cognitive activity is seen as task-relevant, the mind can be seen as operating to serve the needs of a body interacting with a real-world situation (Wilson, 2002). “Off-line aspects of embodied cognition, include cognitive activities in which sensory and motor resources are brought to bear on mental tasks whose referents are distant in time and space or are altogether imaginary. In these cases, rather than the mind operating to serve the body, we find the body (or its control systems) serving the mind” (Wilson, 2002. pp.635).

The findings of this study seem to support this definition of personal experience: that involvement of the body, even in an indirect manner (or off-line mode) was the preferred method of solving the creative problem to using only mental representation. What was also interesting is that the performance results did not show a significant difference between thinking and playing. So it could be suggested that the motivation for wanting to play with the objects even indirectly was not about necessarily enhancing performance. Findings from the Play and Creativity study looking deeper into the role of play, showed that non-related play significantly outperformed direct manipulation of materials in solving a creative task. In that study it was suggested that the interaction with environment may not only be a way of obtaining information but may also be in some way correlated to a person’s “state of being.” Therefore the preference shown by the majority of participants from this study may have been motivated by an inherent natural tendency that was not just about information gathering. Perhaps as Winnicott (1971) suggests, playing or physically interacting with something may well be inherent to our nature.

The findings from this study have shown that there is a very strong preference for people to interact with their external environment, even if the physical feedback is not directly related to the task at hand.
This desire for bodily feedback tends to suggest that interaction with an object is our natural preference in solving complex problems. This study would appear to not only support embodied cognition theories but also begin to show that embodied cognition may well be our natural preference. It would be very interesting to look further into why we seem to have such a strong preference for interacting with our environment.

8.2.7 Correlation between Mental States and Creativity

On average, participants had a greater divergent thinking score (word ratio measure) in the mental relaxation condition compared to the other two conditions. However this difference was only marginally significant for the word ratio measure when comparing the mental relaxation condition with the conscious thought condition.

The combined measure of word ratio and CAT showed a significant difference between the mental relaxation condition compared to the conscious thought condition (but not with the immediate generation condition). It is important to note that these results only became significant when the two measures of creativity were combined. This may be due to the smaller sample size used in our study but is also in keeping with the suggestion made by Plucker and Makel (2010) that no one single measure should be used as a valid assessment of creativity.

While Dijksterhuis and Meurs (2006) looked at mental distraction occurring within the incubation stage, we looked at mental relaxation that Wallas (1926) suggested as being the other aspect that occurs in the incubation stage. Both appear to have a positive effect upon creativity (at least when compared to the conscious thought condition). The relationship between mental relaxation and creativity could be due to two possible reasons. The first being, that mental relaxation can be a form of distraction. The second being, that mental relaxation is a particular mental state as reflected in HRV coherence values. At this point it was unclear whether the mental state was a possible factor, therefore it was important to look more closely at mental relaxation. The next part of the study started to
investigate mental states a little more in terms of HRV coherence and creative output.

**Mental Relaxation and HRV Coherence**

When levels of HRV coherence were compared, there was only a significant difference between the HRV coherence values in task between the immediate and mental relaxation conditions and there were no other significant differences in the HRV coherence data across conditions. However in light of the significant effect found of mental relaxation on creativity (when compared against the conscious thought condition), and HRV coherence not showing up as having a significant effect overall, as shown in Table 7 (section 7.3.3), it was decided to analyze the data in more depth.

In doing so it was discovered that on average there was a marginally significant effect in the ‘Change of State’ (CoS). This would suggest that it is not the absolute HRV coherence value that is significant i.e. the mental state per se, but the change from one state to another. At this point too little is known about the absolute coherence values in relation to creativity. It was therefore interesting to study whether there was a significant effect upon creativity when participants were trained to reach a high HRV coherence level as their initial state before undertaking the task and then tracking their CoS throughout the task. This would give more information about both the absolute HRV coherence value and the Change of State value, as the initial mental state may well be as important as the Change of State.

### 8.2.8 Dynamic Movement within State of Being

In this study the participants were trained to reach a coherent state. This is described by McCraty et.al (2009) as “a harmonious order in the rhythm or pattern of psychophysiological activity which signifies a coherent system, whose efficient or optimal function is directly related, in Damasio’s terms, to the ease and ‘fluidity’ of life processes.” (pp.15). If we consider Bohm’s assertion that one must

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17 Author’s word
be in a childlike, open state when being creative, perhaps this idea that a coherent physiological state could be one of ‘ease and fluidity of life processes’ then we may be moving closer to the state that Bohm was talking about.

In this study only the participants that were first able to achieve a coherent HRV reading were used. What is very interesting, was that the participants that moved from one coherent state to another more than once, showed the highest creativity scores on average (as measured by word ratio values). This would support the theory that movement plays as important a role as the initial state of the person. This is what I had experienced in my own creative process. It was not just about being open when I approached my art but I found that I then ‘danced’ in and out of experience as part of that process. I did not stay in a calm, open state throughout the whole of the process. I was very aware that I had these moments of dissonance and resonance and moved between the two. This was when I was most creative.

This tension between dissonance and resonance may also be an aspect of Flow that Csikszentmihalyi talks about (1997). He talks about this tension between wanting to discover something new and entropy, where we wish for the comfort of the known. It is almost like we must oscillate between the two. If we are always constantly discovering the new and we are always ‘on’ by trying to make novel connections, then we will burn out very quickly. This kind of mode of existence closely resembles manic behaviour. However if we are always in a state of entropy and habituation then we will never move forward, create or evolve and somehow that life force will also leave us (as sadly is too often the case with so many people who have lost that creative element in their lives.). So in a way this balance, this ‘dance’ between the status quo which could also possibly be resonance and novelty which may be born of dissonance are crucially important and possibly the healthy, natural way of the world.

A colleague and I were talking about music in relation to this phenomena of dissonance and resonance and it was interesting that a musical piece that holds our attention and possibly even imagination often has these elements of dissonance and resonance.
He showed the difference on the piano and immediately when a dissonant chord was brought in I could feel myself being more alert, wondering where the connection lay and what the next note would be. The predictability of the resonance was then gone and I was alert and waiting expectantly but then I was also happy when the music slipped back into resonance as I had the opportunity to relax and rest. Csikszentmihalyi also talks about this necessity to have both these elements in life.

Perhaps this small study is also a preliminary exploration into this phenomenon of ‘the dance between dissonance and resonance’ in HRV coherence values or more generally put in the physiological realm. It would be interesting to explore this further.

8.3 Limitations and recommendations for future research for the individual studies.

8.3.1 Fascinating Journey

Within traditional mainstream research communities’ narrative self-study is still questioned for its validity as a valid form of investigation. One of the strongest criticisms of narrative studies, especially narrative self-study, is that there is too much emphasis placed on the individual and not on the social context (Connelly and Clandinin, 1990). However, the individual exploration can contribute a great deal to the field of inquiry if it can be looked at objectively and expanded to a larger phenomenon (Kitchen, 2009). I would have had a difficult time basing my theories solely on my self study as I am in complete agreement that it is important to try to ascertain whether personal insights can then be applied to a larger, more historical setting. I do believe, however that a great deal of valuable information can be obtained from individual experience and should never be dismissed just because it is subjective. It is a much better approach to then try to apply the insights to a larger context to see if they still apply.
This is what I have done with this self-study. In reality this self-study will probably be the basis of my life’s work. If I take the example given by David Peat in chapter 7 of ‘Science, Order and Creativity’ (2011) about David Bohm’s experience of crossing the river, this is a wonderful illustration of the individual experience leading to incredibly valuable insights:

“One day, while approaching a stream with some friends, he (David Bohm), as usual, planned out his set of moves, visualizing in his mind the way he would use the rocks as stepping stones, putting each foot in order to traverse the stream. But as soon as he began to cross he realized that if he stopped moving for only a moment he would fall into the water. The only way he could cross was to keep on moving rather than making a series of transitions between fixed stopping points. At that moment he realized that security did not lie in grasping fixed positions but in continuous movement and flow. It was this order, first understood in a purely somatic way, that had a major influence on all Bohm’s later thinking in science and philosophy” (pp.283).

I think this passage sums up beautifully how an individual’s experience can have far reaching repercussions that are important for a larger, historical context. I believe that I will continue to reflect upon my insights that I have had whilst conducting this narrative self-study for many years to come.

From the self-study there were specific areas pointed out where further investigation may well be fruitful. Language was an interesting aspect of my creative process and I pointed out that it would perhaps be an interesting area of study to pursue by linguists and experts dealing with communication, especially looking at how non native speakers use language as there is an inherent potential for creativity. This would perhaps be a timely area to study this, as our world becomes more of a global village.

Two more fascinating areas to explore further would be that of insight and the role of time in the creative process. These two areas have the potential to give us some very important insights but they are incredibly complex and somewhat difficult
areas to tackle as they often baffle and intimidate the unimaginative, less courageous scientist, so they are then left to the foolhardy and ignorantly courageous artists and philosophers to play with. It would be wonderful to see the scientists enter the arena of the brave, foolhardy and adventurous explorer again.

8.3.2 Cohesive Classroom

In looking further into research of stress in children, particularly in an educational setting there was very little published about this subject. The majority of the studies are either about extreme, traumatic stress (Shakoor and Chalmers, 1991) or prenatal stress in relation to learning (Lemaire, 2000). Further research on the affects of stress on academic performance in children with ‘normal’ stress and anxiety seems like an incredibly important and fundamental area to be explored, particularly as our children seem to be in an ever increasingly stressful school system.

With such school systems in mind it would also be timely to examine why free time is so important to students. Investigating this area could also elicit some interesting insights into what motivates children especially in an educational setting. Providing the opportunity for children to exercise their own self determination and to be able to come from a more intrinsically motivated space within an educational setting would appear to be a rising issue that should be better understood and addressed.

Part of self-determination is self-realization. These elements of understanding oneself in relation to one’s preferred style of learning and being able to play an active role in self-regulating one’s learning has been shown to have a positive effect upon academic performance (Pindrich and De Groot, 1990). However, there has been little research into the role that learning preferences play on the levels of stress associated with learning. This would seem to be a crucially important area to explore when looking at how to optimize an educational system.
8.3.3 Creative Workshops

This was also a small study conducted just with children, so the potential to accurately generalize is limited. However as I pointed out earlier, subjective, qualitative information can lead to interesting insights of where to look in the future. For instance a more in-depth look at the elements of play, independent exploration and the non-linear element of the process could be an incredibly important aspect of the creative process to continue to explore.

8.3.4 Play and prototyping

This was a small study that was set up to make a preliminary investigation into the perception of play by adults and to try out a rudimentary investigation of play in relation to creativity. From these two workshops some important information was gleaned to help in developing further studies in this area. This study contributed to the overall investigation by giving information about the possible elements of play to be investigated, i.e. including social as well as individual play activities to be explored and also to keep in mind the element of constraint.

Explorations into play and creativity in the two workshops raised some important issues that led to further investigation. Firstly, whether play really does support divergent thinking and creative problem solving. Secondly, does the play-undertaken need to be related to the task at hand (e.g. the creative problem to solve); and thirdly, does the form or play (e.g. imaginary, physical, social) affect the level of divergent thinking and creative problem solving? These issues were looked at in the study called ‘Play and Creativity’ that is in this thesis.

8.3.5 Play and creativity

Only fifty participants were involved in the study, covering five conditions, therefore it is difficult to draw too many strong conclusions from the results. This is especially true with regards to the limitations imposed in the ‘Social Play’ condition where participants stated that they did not have enough time to use the
Facebook application effectively, and therefore the amount of social play involved was limited and the comments became more goal orientated.

In the ‘Imaginary Play’ condition information on the imaginary story was presented in a written form and again could have been presented in a more playful and immersive form. It could be argued that the ‘Non-Related Play’ condition also had an element of social and physical play. Finally it might have been useful to understand how engaged each participant felt in their play condition after completing the activity.

This study has highlighted a very interesting, possible link between play, autonomy, state of being and creativity. I have begun to explore these possible relationships more deeply at a quantifiable and qualifiable level and intend to continue to do so in future studies. There is a great deal more that needs to be understood about the nature and role of play in the creative process.

8.3.6 Study of modal preferences and creativity

A very practical issue that is mentioned in the methodology section of this paper was the difficulty of moving the shapes on the computer screen. The software program could be developed so that the shapes are more easily moved to create the three dimensional shape. A suggestion by one of the participants was to use a touch screen, as a more direct way of moving the shapes.

Another area to consider if this study were to be replicated would be to use more than one puzzle. This particular puzzle was a De Bono lateral thinking puzzle related to creating shapes. Many of the design students were familiar with this type of problem. Perhaps using one or two different problems that were not just geometric would provide more information about complex problem solving preferences.

Of course this area of natural preferences is a fascinating one. Taking into account some of the observations that were also made in the other studies it would also be interesting to look at the affect that following one’s natural preferences has upon one’s ‘state of being’.
8.3.7 Correlation between Mental States and Creativity

The Consensual Assessment Technique (CAT) developed by Amabile (1982) has been criticised in creativity research as not always being a strongly reliable measure of creativity (Kaufman et al., 2009). This was often due to there being ambiguousness of the term ‘expert’ which is open to subjective opinion. Perhaps other measures of creativity could also be used if this study were to be conducted again, to gain an even more robust measure of creativity.

When asking the participants about whether they were actually feeling mentally relaxed in the mental relaxation condition, not all reported that they were, therefore there is some ambiguity about the actual state that they were in. What is also interesting in the mental relaxation condition is that not all the participants were showing a high level of HRV coherence. That would support what the participants’ had been reporting about their mental state.

This study was conducted on a small sample, which could also have affected the significance of the results.

Further research to look more deeply at the role of HRV coherence and its affect on creativity will need to be conducted. This led to the next study which explored whether there is a significant effect upon creativity when participants are trained to reach a high level of HRV coherence as their starting point. In addition, it would be important to investigate the effect of the initial mental state as well as the Change of State, as both may prove to be as important in relation to creativity. In future studies it would also be important to clarify what particular mental states are related to high HRV coherence. Future HRV coherence analyses should have a much larger sample size.

8.3.8 Dynamic movement within State of Being

This was again a small study of only 16 participants, which can influence the significance of the results. But nevertheless in this study there was a significant difference found of this movement in and out of HRV coherence as compared to little or no movement in relation to creativity. What would be important going
forward would be to conduct a similar study with a larger sample, to investigate the findings from this smaller study.

It would also be interesting to look more closely at the HRV coherence patterns that are being recorded, looking at direction of movement and perhaps even nature of the movement. As I talked about earlier, I personally experienced what I call a dissonance and resonance in my flow of ideas. It would be interesting if this could be ‘mapped’ through the HRV coherence patterns when participants were carrying out a creative activity or task.

The readings from the HRV coherence values were also only over one minute. It would also be interesting to conduct a study where the HRV values were recorded for a longer period of time. This would entail a different kind of activity but it would be something to consider for the future.

8.4  Bringing the findings together

From these eight studies it is important to point out that even though many of the studies had small sample sizes, when they are taken collectively a pattern starts to emerge. What is powerful here, is that the elements that show up as having an affect on creativity are doing so in a number of different contexts. This should counteract any concerns about the studies being small. This is where the Triangulation method can become a very powerful methodology. From these diverse studies there were five main elements that consistently appeared in relation to creativity. These were ‘state of being’, play, natural preferences, dynamic movement, and self-determination/ intrinsic motivation. In this section I will talk about in which studies these elements were evident and how.

Let’s start with ‘state of being’. For ease of reading I will again give the definition that I am using for ‘state of being’: the emotional, mental and physical condition of a person. The ‘state of being’ in relation to creativity showed up in the qualitative studies of:

- Fascinating Journey (self study)
- Creative workshops (with the children)
• Cohesive Classroom study

The quantitative studies:
  • Mental State and Creativity
  • Dynamic movement within State of Being

There were also very slight elements showing up in the play and creativity study as a possible reason for the significant result of the non-related play participants.

In the qualitative studies, 'state of being' was either self reported or observed. In the qualitative studies 'state of being' was measured using HRV coherence values as well as using qualitative information from the participants.

The element of play showed up in qualitative studies of:
  • Fascinating Journey
  • Creative workshops
  • Play and Prototyping

The quantitative studies:
  • Modal Preferences in Creative Problem Solving

There were different forms of play evident in these different studies, therefore it is important to define play to ensure that there is a consistency in the use of the term play. Play can be briefly defined as; when a person engages in an activity for enjoyment and recreation rather than a serious purpose. Play also seemed related to natural tendency, as it was often the automatic, natural reaction of both the children and adults when approaching a creative task or activity.

This brings us to the next element, which I have just pointed out is closely related to play in that play was often the natural tendency of the person or child when engaging in a creative activity. The element of natural tendency also showed up in: qualitative studies of:
  • Fascinating Journey
  • Cohesive Classroom study

The quantitative studies:
• Modal Preferences in Creative Problem Solving

Natural tendency could be defined as one’s natural inclination or spontaneous reaction. It was not just the natural tendency to play that appeared in these studies but also the natural tendency to move, to learn in a certain way, to explore an idea or problem in a more physical, experiential manner that also appeared in these studies.

This element of movement, particularly dynamic movement appeared in a number of the studies from this research series. In this paper dynamic movement has been defined as: a continuous motion of personal experience that is of a spontaneous and non-linear nature. This element was evident in the qualitative studies of:

• Fascinating Journey
• Creative workshops

The quantitative studies:
• Mental State and Creativity
• Dynamic movement within State of Being

I think it is important to point out that in the HRV coherence studies the personal experience was measured as a physiological experience rather than a personal, narrative experience.

Self-determination/intrinsic motivation can be defined as “behaviours that are volitional and accompanied by the experience of freedom and autonomy—those that emanate from one’s sense of self” (Ryan and Deci, 2000). This was an element that also consistently appeared in the qualitative studies of:

• Fascinating Journey
• Cohesive Classroom study
The quantitative studies:

- Modal Preferences in Creative Problem Solving

In the modal preferences study, this element was not formally investigated but appeared in the reports from the participants during the course of the study.

I think the most important aspect of this section is to point out that the main elements of 'state of being', play, natural preferences, dynamic movement, and self-determination/ intrinsic motivation were showing up consistently in very different contexts and under different conditions.
Chapter 9  Practical applications for these findings

It’s interesting that this research series began its life from a very practical source – that of my personal experience of the creative process as a practising artist. It would only seem right to return this work to its roots of being grounded in the ‘real world’. Just as an aside it is interesting to me that there is a separation between the real world and the academic or research worlds. I wonder (and worry) why that is so. Surely they should be one and the same. But there is very much a distinction made between the two and now that I have been straddling the two, I have seen many examples of this divide. So before I move to real life applications of this research work, I want to firstly try to understand why there is this distinction.

What exactly is the difference between the two worlds? The real world is made up of actual happenings, living an idea or concept or as I will shortly attempt, a practical application of findings. So what is the difference between the academic world? The word academic is used to denote something that is abstract and often not practical; “not of practical relevance; of only theoretical interest: the debate has been largely academic” (academic, 2012).

Again I ask myself why do we make the distinction? I also would like to ask how then is academia useful to the real world? I believe I am not the only person to ask this! I am not saying that there is no place for academia but I am wondering why there is this massive divide between the two worlds. It is perplexing to think that it is not imperative once one has a theoretical understanding of a phenomenon, that a practical application is then sought as the natural and important next step. Perhaps this is why there is such a great deal of criticism of the world of academia from the ‘real world domain’ of business people, educators and the ordinary people ‘on the street’; because they are just not seeing a practical application of these vast mountains of theories and knowledge that are being produced in that other world.

Being a very practical person myself, it was of absolute importance that whatever I discovered in this research series, I would then be able to offer practical applications of those findings. So here we go. In this chapter I will point out how these findings can be applied in the contexts of education, business, personal lives
and research. Before I do that however, I would just like to recap on what the main findings were in relation to creativity and what they mean. These were ‘state of being’, play, natural preferences, dynamic movement, and self-determination/ intrinsic motivation.

‘State of being’ is the emotional, mental and physical condition of a person. Play can be briefly defined as when a person engages in an activity for enjoyment and recreation rather than a serious purpose. Natural tendency could be defined as one’s natural inclination or spontaneous reaction. Dynamic movement is defined as a continuous motion of personal experience that is of a spontaneous and non-linear nature. Self-determination/ intrinsic motivation is defined as behaviours that are volitional and accompanied by the experience of freedom and autonomy. These elements will now be applied in the context of creativity in a practical sense in to four areas of education, business, research and our personal lives.

**Education**

How are these elements of ‘state of being’, play, natural preferences, dynamic movement, and self-determination/ intrinsic motivation applied in an educational setting? I have actually touched on some ways in the qualitative studies I carried out in the cohesive classroom and the creative workshops. I am also constantly trying out my theories whenever I have the opportunity. I think the best way of illustrating how these elements can be applied in a practical sense is to paint you a picture of a school that would have applied these elements. We will call this school CREATE, just for ease of reference.

In the CREATE school a child would have the opportunity to explore ideas and concepts relatively independently. Experiential learning and individual time would be built into the timetable. Students would be encouraged to play with ideas and materials, to experiment and try things out to learn, problem solve and create. This would incorporate the elements of play, natural preferences, dynamic movement, and self-determination/ intrinsic motivation. A very real example of an opportunity to do this was described in the ‘chill out time’ in the cohesive
classroom study. Another example is of this is the ‘creativity clubs’ in the creative workshop study.

In a CREATE school, children would also be given the opportunity to self-reflect and be encouraged to be aware of their ‘state of being’, whether it was through using tools such as HRV coherence software and games (Heartmath institute), or through journaling or talking with a mentor. Time would be put aside in the day to allow children the space to self reflect as this is one of the greatest obstacles of awareness of one’s state – lack of time and space. At the moment I do this in the creativity clubs by providing a ‘chill out’ room that is next to the classroom. This is a small room with cushions and soft lighting where the children can go when they need to and they have the opportunity to self reflect, use a coherence monitor or write down their thoughts and feelings.

In CREATE schools, children would learn about their natural preferences and modes of learning and creating. This was also done in the cohesive classroom, where children started to understand how they preferred to learn. They also would become aware of how they reacted when stressed. Children would be allowed to learn and to create in accordance to their natural preferences. For example if there are children who prefer to learn experientially, an opportunity would be made for them to ‘experience’ a concept rather than just be told about it.

Children would also be given the opportunity to explore concepts in a non-linear manner in the CREATE schools. This is more challenging but can be done when there is the allocation of time and space. A good example of how children are already doing this would be in the Sudbury Valley schools. These schools are a good example of incorporating dynamic movement, self-determination and intrinsic motivation that takes a great deal of courage and flexibility. If this is too far along the spectrum for most people it is also possible to build ‘exploration time’ into a timetable such as having ‘individual time’ or ‘free time’. 
A Concrete example in Education

In 2013 the first Createschool has been established in Munich, Germany. This school will be for students from 1st grade all the way through to 12th Grade. The school has integrated the principles pointed out by this thesis by incorporating chill out time in the timetables as well as timetabling many subjects to be delivered over a whole day rather in 45 minute blocks, to allow for ‘meandering’, play and creative involvement of the students. The local curriculum has been integrated into this school but is delivered in a way that is more experiential and related to real life so that the students have a context with which to build their knowledge. Time is given for students to be able to play with knowledge and ideas. Students have mentors that help them to become aware of their learning preferences and to encourage the students to play an active role in their learning journey. An HRV coherence lounge will be installed in the school for students, teachers and researchers to use. The school will also work closely with researchers to evaluate the efficacy of the education methods being used. For more information please visit the website: www.createschools.de

Business

One of the major requirements within the business world would be a change of currently held concepts. Currently creativity is being seen as completely unrelated or maybe even the opposite to productivity (Adobe, 2012). In order for a practical application of these elements to work there would have to be an acceptance that creativity is an incredibly important element of productivity. Then we could talk about how to apply these elements to a business environment.

Thankfully there are businesses already out there that are allowing for some of these elements to occur, particularly in the area of self-determination and intrinsic motivation (Pink, 2009). The areas that I believe will be most difficult for businesses to apply are ‘state of being’, play, natural preferences and dynamic movement. A big reason for this is because there is a perception in the business world that if you are not doing anything then ‘you are not doing anything’.
Also there is another holy grail of the business world that things worth doing should be hard work, if something unfolds naturally or simply then there is something wrong with it – it was just too easy!

These widely held beliefs would have to be released for the elements of ‘state of being’, play, natural preferences, and dynamic movement to be able to be incorporated into a business environment. But if one were courageous enough to do this then a business that is incorporating these ideas would look like this:

Firstly employees would be given the opportunity to understand themselves and their natural preferences through a series of profiling exercises. The office culture would provide an opportunity for people to take time to reflect and become aware of their ‘state of being’. This could be through using tools, dialogue or self-reflection. Play spaces would be available; this is not just a physical room that people could ‘play’ in but also a mental space that is allowed for people to play with ideas and concepts. An acceptance and understanding for a non-linear unfolding of ideas would be the ‘norm’ of the office culture, rather than a freakishly unnerving event that happens every now and then.

Time and space would be allowed for people to incorporate all these elements of ‘state of being’, play, natural preferences, dynamic movement, and self-determination/ intrinsic motivation. This would mean that people would possibly spend less physical time in the office but with technology they could still be available when needed. Some of this is starting to happen in the business world, where people are now able to have ‘work from home days’ and there are some companies that see the benefit of play (Schrage, 1999) but there is still this huge chasm between the perception of productivity and creativity. Perhaps this chasm will only be breeched when a few brave companies can show that these two concepts are more closely related than most people think.

**A Concrete example in business**

The Centre for Creativity was founded in 2013 for the application of research findings about creativity - particularly the findings from this thesis.
Training programs, consultancy and workshops will be held to teach members of the business community and the public sector on how to integrate principles from this thesis as well as further research that will be carried out in the future. Evaluation of corporate and public sector cultures will be carried out, as well as training, profiling and workshops to assist people to see how to practically apply ‘state of being’ and ‘dynamic movement’ into their work environment as well as other elements that are inherently important for creativity.

For more information please visit the website: www.centreforcreativity.co.uk

**Research**

I believe Bohm and Peat (1987) had begun introducing ideas of how to start to incorporate the elements of ‘state of being’, play, natural preferences, dynamic movement, and self-determination/ intrinsic motivation into the academic and research worlds. Again a significant change of mind set would need to occur. The mind-set in this environment is not so much about productivity but more about exclusivity. The research and academic world seems to be made up of a great number of exclusive clubs – cognitive science, mathematics, physics, neuroscience etc. All of which tend not to step outside their area of expertise, nor to be very open to novel ideas or input from ‘non members’.

There is surprisingly, an allowance to play but generally only within one’s own domain or area of expertise. This tendency to rigidly stick to one’s own world of expertise is what is predominantly stifling creativity in the research world. There is a great deal of entropy and a rather large resistance to novelty. Again courage will be needed for people to step outside of their comfort zone.

So what does a research community look like that is incorporating the elements of ‘state of being’, play, natural preferences, dynamic movement, and self-determination and intrinsic motivation? In this community there would be an emphasis on the personal experience and self-reflection.
Natural tendencies would not be dismissed as too simple or easy but be recognised as being simply profound and an incredibly important source of information not to be ignored.

Dynamic movement would be in the form of cross-disciplinary and ‘real world’ exploration and play, not only dialogue. The echelons of academic norms would be dismantled to allow and encourage more self-determination and intrinsic motivation.

**A Concrete example in Research**

The Centre for Creativity was founded in 2013 for research into creativity and to begin applying the findings from this thesis, in particular the triangulation methodology with dynamic movement. Researchers will be encouraged to work with other researchers from very different backgrounds and knowledge bases. Researchers from different cultures will also be brought together to work on projects. Researchers from the center will work closely with schools (such as Createschools) and universities as well as the business sector to ensure that ‘real world data’ and applications are being applied.

For more information please visit the website: www.centreforcreativity.co.uk

**Personal Lives**

It is interesting that in the Adobe study of creativity (2012) 66% of those surveyed believed that creativity was important but only 25% reported that they were living up to their creative potential. One of the main reasons they reported that they were unable to realise their creative potential was that of not having enough time. However, I do not believe that this is the core issue that is stopping people from realising their creative potential. It lies more in the area of priorities and permission.

It is amazing how much time we waste in our day. We waste time on distracting ourselves in all number of ways; social media, entertainment, idle gossip and mental ruminations. All these activities have somehow been given permission to
take up time, but to engage in creative acts is often loaded with guilt or seen as an enormous luxury. The mind-set that would need to change would be that of how creativity is seen. Even though creativity was rated as important it is also seen as having no relation to productivity or being of very much use. It is still very much seen as an activity of luxury (Csíkszentmihályi, 1996, Robinson, 2001). This may be why very often creative subjects, especially theatre and dance, are being dropped from schools, as they are not being seen an essential part of education (Robinson, 2010).

So how does the life of a person look that has been able to incorporate the elements of ‘state of being’, play, natural preferences, dynamic movement, and self-determination/intrinsic motivation? Well first and foremost there has to be a belief that creativity is essential to living a healthy, whole life. This must be the starting point; otherwise self-determination and intrinsic motivation already are missing. The next very important element is about ‘state of being’. There must be a dedication to being self-aware and being able to recognise what state one is in. This will require putting aside time and space in order to gauge on a regular basis what ‘state of being’ one is in.

In order to incorporate the other elements of play, natural preferences, and dynamic movement one will also need courage and conviction. An enormously important aspect of incorporating these elements into one’s life is permission. This is why conviction is so important because you must have the conviction that creativity is so essential to your life that you are willing to give yourself permission to play, to allow yourself to follow your natural preferences. Courage is required in order to move through life in a continuous motion of personal experience that is of a spontaneous and non-linear nature. This takes courage and a fairly large amount of trust. Non-linear unfolding of one’s life is very difficult to allow and to accept (even though that is often what happens in the end!) but we have a tendency to look for lineal cause and affect in our lives.
But I must say that the way that I learnt to allow for this non-linear, spontaneous manner to play a role in my life was by observing the incredible unfolding of nature. The natural world taught me how dynamic movement holds an incredible intelligence and complexity that I could never conjure up with my linear thinking. But how does that look practically? Let me see if I can give a simple, concrete example of dynamic movement in action. I started my university studies studying Psychology but then 6 years into working in the filed I decided to become an artist, I then worked as a professional artist and held creativity classes for adults and children to make ends meet. I also explored meditation in my art. I then moved to a country where I was not known and became a mother. I continued painting and meditating whilst bringing up my children. At one point I started teaching in a school. Many of the aspects of my life seemed to be unrelated but then one day it all came together when I decided to research creativity. It’s a great example of a non-linear movement that came out of my continuous personal experience and led to interesting creative outcomes. But perhaps it’s a rather large, intimidating example. A simpler example may be the way that I have been writing and researching for this thesis. I will write for a while and then I can feel myself becoming tired or the flow of ideas slowing down. I will then reach for a book. I do not decide which book I will pick up but often just intuitively reach for one. Often what happens is that I read something in the book which is important for what I am writing or holds a connection that I had not thought of before and fires a spark in me to write again.

But this dynamic movement is not only important in how we move through life in an external, physical sense, the internal movement is also important. These continuous experiences then need to be integrated into our ‘state of being’. Self-reflection is an important element of this self-awareness. An example of this is when I am painting, I am not just reflecting on the physical properties of what I am doing, I am also reflecting on what this experience means to me as a person.
If I were to paint a particular cluster of trees I would not just be painting what I see but I would also want to convey what I feel about that cluster of trees or what that cluster of trees means to me on a very personal level. Therefore it is so important to set aside time and space to self reflect in order to create and to lead a life that has creativity as a core element to it.
Chapter 10 Conclusion.

10.1 Introduction
In this section I will review the research project in relation to the aims and objectives that were set out at the beginning of the thesis; the contribution that this research has made to new knowledge will be put forward; and recommendations for future research will be proposed at the end of this chapter.

10.2 Evaluation of research aims
The research was conducted in order to address the following research aim:

“to study subjective experience in order to establish whether ‘state of being’ and ‘dynamic movement’ have a relationship to creativity.”

The extent to which the research has met this overall research aim is evaluated here in relation to the research objectives identified.

10.2.1 Research Objectives

Objective 1:

To identify key propositions of the creative process based on my 15-year self-study

The key propositions identified from my 15 year self study were:

- State of being;
- Interaction with the environment
- Dynamic temporal and spatial movement

Objective 2:

To analyse my 15 year self study and compare those findings to contemporary creativity and mind theories.
In analysing what I had found in the self-study and comparing my findings to those of the contemporary creativity and mind theories, I then adjusted my three key propositions so that they then became two key propositions in relation to creativity. This adjustment was made after reviewing the theories of embodied cognition, which illustrated that interaction with the environment, and a dynamic temporal and spatial movement could be consolidated by the idea of dynamic movement. The two key propositions or elements put forward for examination are: ‘state of being’ and ‘dynamic movement’. I then defined these key terms in the context of creativity:

• ‘state of being’ is defined as the emotional, mental and physiological condition of a person
• ‘dynamic movement’ is defined as the continuous motion of personal experience that is of a non-linear and spontaneous nature.

**Objective 3:**

*Design qualitative and quantitative studies to investigate these key propositions as defined in objective 1.*

In this research I designed eight studies to investigate and test the key propositions of ‘state of being’ and ‘dynamic movement’ in relation to creativity.

There were four qualitative studies:

• A fascinating Journey
• Creative Workshops
• Cohesive Classroom
• Play and Prototyping

And four quantitative studies:

• Play and Creativity
10.3 Contribution to Knowledge

I believe in this day and age it is extremely difficult to say categorically that one has made a unique contribution to knowledge. Having said that I can confidently say that one area where I am sure I have contributed to new knowledge is in my self-study, which is about my experiences. I am confident about this because this information has come from an individual with a complexity of experiences that are unique, therefore any information that has been gleaned from this will be of a distinct nature.

Earlier on in this thesis Henri Bergson, David Bohm and David Peat offered the broadest universal understanding of creativity. Bergson contributed to the understanding of creativity as part of his philosophy of understanding of the mind and universal knowledge. David Bohm and David Peat were also exploring creativity in terms of a universal understanding of our world. These two great scientists were also interested in the movement and order that the creative process seemed to reflect. The results from these eight studies are starting to give some empirical evidence to support some of the assertions by these great thinkers.

Csikszentmihalyi’s contribution to a universal understanding of creativity seemed to be two main factors. The first assertion that all those creative people had one thing in common and that was, that they loved what they were doing. The second contribution is the concept of flow, which also seems to hold some similar elements to Bergson, Bohm and Peat, in which he talks about a state of being. The research from this PhD starts to suggest that flow has a number of similarities to play and is also in some way related to ‘state of being.’
The emergence of the recent debate of the situatedness of the mind is also very important in investigating creativity.

Embodied cognition theorists have started to introduce the idea that the body and not the brain alone are playing an extremely important role in functions of the mind. Bergson, Bohm and Peat as well as artists have also reported that the element of physical interaction with the world at large is an inherent and crucially important element of the creative process. This has also been shown to some extent in some of the studies conducted for this research.

Play has also recently started to enter the field of debate about embodied mind, learning and creativity. Gwen Gordon has started to explore play at a much deeper level, delving into our fundamental nature. Winnicott had also introduced the fundamental importance of play as an act of creativity. Again findings from a number of the studies conducted as part of this PhD start to support the assertions of Gordon and Winnicott.

Identifying and defining key elements of ‘state of being’ and ‘dynamic movement’ is also a contribution made by adding new elements to be considered in the realm of creativity. These are not new terms per se but by having a clear definition and the way that they are being applied in relation to creativity, are.

Another contribution to knowledge is the practical application of these key elements found from these studies. The first practical application was the way that this research was conducted. A triangulation methodology was used which is not completely new but my approach to this research was similar to how I had approached my art. Therefore I was very much aware of my state of being throughout the whole process. I designed and conducted the research using the element of dynamic movement from the beginning until the end. I would therefore call this new approach a Triangulation methodology with dynamic movement.
I am not sure if I can say that a relationship of ‘state of being’ and ‘dynamic movement’ to creativity has been fully established at this point but I believe this research has definitely started to contribute in establishing one.

### 10.4 Future Research

Earlier in this paper I pointed out avenues for future research for the specific studies. In this section I would like to point out more general areas that require further investigation.

There are three major areas that this research highlights as requiring further investigation. These areas are in the context of creativity research:

- ‘State of being’ in relation to play
- Dynamic movement in relation to ‘state of being’
- Self-determination and intrinsic motivation in relation to ‘state of being’.

I believe that these elements are all somehow interrelated and by investigating them further we may well gain a greater understanding of dynamic movement. The methods of investigating using different methods has proved to be a incredibly fruitful one and I would highly recommend that further investigation continues using the triangulation method with dynamic movement. Therefore I would highly recommend that further study into these factors be conducted in ‘real world’ situations as well as controlled empirical experiments.

It would also be very interesting to take a more in-depth look at ‘state of being’ particularly in relation to play and intrinsic motivation. Not to mention understanding more about HRV in relation to mental states. Being able to have quantitative data not only on ‘state of being’ but also dynamic movement is rather exciting as it opens up the possibility of being able to map this movement mathematically. There is currently work being carried out by scientists that is looking at non-linear analysis of HRV (Conte et.al, 2012) which may well be something to ponder later on in relation to mapping the creative processes.
My interest in doing this is based very much on my observations throughout my life and I think it would be fascinating to see if the dynamic movement of creativity is similar to the unfolding of nature or to the implicate and generative order that Bohm (1980) talks about. It would be lovely to map the ‘dance of creativity’. Of course this is possibly a long way off and I would need some seriously brave scientists and mathematicians to venture on such a journey with me but it is fun to dream!
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Appendix A

Questionnaire used in Modal Preferences in Creative Problem Solving Study.

Deliberate Play

Today we have a puzzle here for you to solve. You can see there are three separate shapes, can you put these two dimensional shapes together to make a three dimensional shape?

You can choose to solve this puzzle by either thinking about it and then solving it in the minimum number of moves OR by playing with the shapes (you can move them, using the mouse, as many times as you like.) and then solving it.

You have five minutes to try to solve this puzzle.

Good Luck!

When you have finished this puzzle, please fill out the following short questionnaire.

1. Did you enjoy solving the puzzle?  □ yes  □ a little  □ no
2. How did you find the puzzle?  □ easy  □ ok  □ difficult
3. If you were to do another puzzle like this how would you prefer to solve it?  □ thinking about the solution  □ playing around with the shapes.
4. Have you ever done a puzzle similar to this one before?  □ yes  □ no
5. Why did you choose to solve this puzzle in this particular way?
Appendix B
Overview of Brain Dominance Profiles from Cohesive Classroom study.

<table>
<thead>
<tr>
<th>Brain Dominance Profile (BDP)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Right hemisphere, right hand, foot, eye and ear. (also known as Einstein profile)</td>
</tr>
<tr>
<td>DD</td>
<td>Left Hemisphere, left hand, left foot, right ear and eye</td>
</tr>
<tr>
<td>LL</td>
<td>Right hemisphere, right hand, eye and ear. Left Foot.</td>
</tr>
<tr>
<td>FF</td>
<td>Left Hemisphere, left hand, left foot, left ear, right eye</td>
</tr>
<tr>
<td>K</td>
<td>Right hemisphere, right hand and ear. Left eye and foot.</td>
</tr>
<tr>
<td>II</td>
<td>Right hemisphere, right hand. Left Foot, eye and ear.</td>
</tr>
<tr>
<td>JJ</td>
<td>Right hemisphere, right hand, eye. Left Foot and ear.</td>
</tr>
<tr>
<td>PP</td>
<td>Right hemisphere, right foot, eye and ear. Left hand.</td>
</tr>
<tr>
<td>EE</td>
<td>Left Hemisphere, right hand, left foot, ear and eye</td>
</tr>
<tr>
<td>KK</td>
<td>Right hemisphere, right hand, ear. Left eye and foot.</td>
</tr>
<tr>
<td>H</td>
<td>Left Hemisphere, left hand, left ear, and eye. Right foot,</td>
</tr>
<tr>
<td>G</td>
<td>Left Hemisphere, left hand, left eye. Right foot and ear,</td>
</tr>
<tr>
<td>O</td>
<td>Right hemisphere, Left hand, eye, and foot. Right ear.</td>
</tr>
<tr>
<td>N</td>
<td>Right hemisphere, Left hand, ear, and foot. Right eye.</td>
</tr>
<tr>
<td>HH</td>
<td>Left hemisphere, hand, foot, eye and ear.</td>
</tr>
</tbody>
</table>

Appendix C

Published & Presented Conference papers

• Cohesive Classroom .................................................. p.198 - 204

• Modal Preferences in
  Creative Problem Solving.......................... p.205 - 210

• Play, Autonomy and
  the Creative Process ................................. p. 211 - 217
Cohesive Classroom

Gina Deininger, Stefanie Krohn, Trevor Lightbody and
Class 3a (2010) Bilingual Primary School.

Abstract
This was an action research study undertaken at a Bilingual school in Germany. The study focused on a third year primary class (8-9 years of age), a class teacher and a teacher's assistant. The study was aimed at looking at factors that affect cohesiveness in a classroom. The children were exhibiting difficult behaviours in transitioning, interacting with one another and exhibited irresponsible behaviour in unsupervised situations. The term cohesiveness was difficult for bilingual students of this age to understand, so the students were asked to role-play different situations of cohesiveness and non-cohesiveness. They described non-cohesive behaviour as being: not concentrated, stressed, rushed, clumsy. Cohesive behaviour was described as calm, concentrated and moving slowly. The students were assessed through interviews and observation to determine their learning style preferences. The majority of students preferred learning through experiential and tactile means. They also preferred artistic outlets as a means of learning and expressing themselves. An opportunity arose during this study for the students to have unstructured time where they could initiate their own activities. This time was called “chill-out time”. The children were able to choose their own activity as long as it was a quiet, relaxed activity. The students chose mostly to draw, play, build with blocks, massage one another or read. This “chill out time” proved to be incredibly important in contributing to the overall cohesiveness of the class. The children and teaching staff all reported that the “chill out time” was the major contributor to the class feeling more relaxed and being more cohesive. There were two very interesting aspects of the “chill-out time” that were observed: the element of autonomy for the children and the activities chosen were often of a creative nature.

Key Words:
Action research, classroom, primary, cohesiveness, autonomy, creative.

*****

1. Background
This was an action research study undertaken in a private school in Munich, Germany. This study focused on a third year Primary class (8-9 years), a class teacher and teacher's assistant.

The study was started in March and was aimed at identifying the factors that affect cohesiveness in a classroom setting.

This particular class was chosen due to the fact that there had been ongoing problems with how the class members were interacting with one another and the teachers. The children were exhibiting difficult behaviors in transitioning between lessons, in their interaction with one another and poor, irresponsible behavior in unsupervised situations.

The teacher approached me as I had been working in the school for over a year and she also knew that I was researching coherent states in adults and children. Other behaviour management strategies had been used but there had been little or no success. When she told me of the situation and I had observed the class on a couple of occasions, I thought that involving the children in their own problem solving could be an effective way of approaching this problem.
The students were introduced to the concept of action research and the idea of cohesiveness. The study began in March and went until July 2011. During that time the study was conducted based upon the structure first introduced by Lewin

The first step then is to examine the idea carefully in the light of the means available. Frequently more fact-finding about the situation is required. If this first period of planning is successful, two items emerge: namely, “an overall plan” of how to reach the objective and secondly, a decision in regard to the first step of action. Usually this planning has also somewhat modified the original idea.

The next step is ‘composed of a circle of planning, executing, and reconnaissance or fact finding for the purpose of evaluating the results of the second step, and preparing the rational basis for planning the third step, and for perhaps modifying again the overall plan. (1946, 37):

As pointed out by Lewin the first step was to examine the idea carefully. This was done through discussions with the teacher and teacher’s assistant, parents and students. It was then agreed by all parties that it would be an interesting exercise to look more deeply into possible reasons for the non-cohesiveness of the class.

The exercise in itself already began to have an affect from the moment the participants were included in coming up with a solution.

Once the parents and the children had given consent, a conference was held with the students, teachers and myself, exploring more deeply the idea of cohesiveness. This word and concept was a little difficult for bilingual students of this age to completely understand, so the students were asked to role-play different situations of cohesiveness and non-cohesiveness. The students seemed to gain an understanding of the concept very quickly using this method. They described non-cohesive behaviour as being: not concentrated, stressed, rushed and clumsy.

Cohesive behaviour was described by the students as being calm, concentrated and moving more slowly.

Factors that could affect the student’s own cohesiveness were then discussed. The students and teachers reported that they lost cohesiveness when they were rushed, stressed, yelled at and tired. They reported becoming more cohesive when they could play, do sport, listen to music, be massaged and draw.

From the initial group discussions about cohesiveness in the classroom, the concept of ‘the power of one’ was introduced by some of the students.

The students asked, "If one person is cohesive and the others are not, will that then make that person lose their cohesiveness? Or can that person or a few people help to increase the cohesiveness in the classroom, just by being that way themselves.” (April 2011, excerpt from field notes.)

2. The Power of One

With the question about the ‘power of one’ in mind we decided to look at the individual first and then move onto the group. We started by trying to understand ourselves better i.e. how we process
information and what happens when we are stressed. We started by using a VAK\(^1\) test derived from Haberda (2005) to look at how the students and main teaching staff of the classroom naturally process information. This test was aimed at gaining a rudimentary understanding of the learning styles of the students and teaching staff. Observations of, and self-reporting from the individual class members were also carried out to compare to the findings of the VAK test to ensure greater consistency. (Fleming, 1995).

Table 1 - the number of students and their dominant learning style.

<table>
<thead>
<tr>
<th>Number of Students</th>
<th>Tactile/Kinesthetic</th>
<th>Visual</th>
<th>Auditory</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td></td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1 shows that the majority of the class had a preference for learning through Tactile/Kinesthetic modalities. Tactile/Kinaesthetic learners prefer to learn via experience—moving, touching, and doing i.e. active exploration of the world. (Fleming, 2006)

Hannaford (1995, 1997) talks of the Brain Dominance Profile (BDP) and the affect that stress can have on an individual’s performance. A workshop was conducted, whereby the students tested themselves and each other to determine their BDP. The students recorded their findings on a large life-size drawing of themselves. Later the results were checked on an individual basis using methods suggested by Hannaford (1997), Haberda (2005) and a professional lerntrainerin.\(^2\)

Some of the initial results were revised after testing and individual conferencing. Table 2 shows a breakdown of the findings of the BDF of the students.

Table 2 – Brain Dominance Profile of the students and the number of right brain dominant profiles

<table>
<thead>
<tr>
<th>Brain Dominance Profile (BDP)</th>
<th>Number of students</th>
<th>Right Brain Dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>DD</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>LL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>FF</td>
<td>1</td>
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<td>K</td>
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<tr>
<td>HH</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

The results shown in Table 2 give a break down of the different dominance profiles as categorized by Hannaford (1997). Also shown are the number of profiles that are right brain dominant (9 out of 15). This is important, as people who are right brain dominant have been shown to have a greater tendency to be creative and approach learning differently. (Hannaford, 1997; Hermann, 1991). They feel easily constricted in a very structured environment (like a school day) and tend to “shut down” in stressful situations, unable to maneuver themselves out of it. This creates tension in their immediate environment. (Hannaford, 1995).

3. Chill out Time
A development that naturally occurred whilst the individual conferences were being held, was the possibility of free time for the students who were not being interviewed. This happened at the time that was originally put aside for the class to work as a group. This free time was named “chill out time” and had the following conditions:

“You can do whatever you like, in the classroom, as long as you are not disturbing the other people around you. You can do things in small groups or by yourself” (Excerpt from Teacher’s instructions, end of April, 2011).

This ‘chill-out time” became an extremely important factor for the cohesiveness of the classroom. The students valued this time immensely and looked forward to it.

“Can we PLEASE have “chill out time??” (This question was asked on one occasion by 18 of the 21 children of the class, at the beginning of the session put aside for the study.)

Towards the end of the study when the students were asked what helped them most to reduce their stress and feel more cohesive, almost all of the class reported “chill out time”. In this ‘chill out’ time students were allowed to pursue something quietly that they enjoyed in small groups or individually. The activities varied sometimes but for the main part they consisted of drawing either as a small group on large paper or individually, playing with building blocks, inventing board games, massaging one another or reading. Relaxing music was often played in the background.

5. Cohesometer

At around the time that the individual testing of students’ learning styles and BDP were finished, an interview with the teacher led to the idea of the students becoming more aware of how they were feeling. This was suggested as the first step to the students beginning to take responsibility for their own actions and feelings. A simple tool for self-reporting was developed and called the Cohesometer. (see Image 1). This tool was given to all class members at the beginning and the end of the day for two weeks.

The results of those two weeks of monitoring are shown in Image 2.

---

**Image 1 - An example of the Cohesometer.**

<table>
<thead>
<tr>
<th>Morning</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Good</td>
<td>Quite Good</td>
<td>O.K.</td>
<td>Not O.K.</td>
<td>Stressed</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
<td></td>
</tr>
</tbody>
</table>

**Wednesday:**

End of Day

|  |  |  |  |  |  |
|---|---|---|---|---|
| Very Good | Quite Good | O.K. | Not O.K. | Stressed |
| 1. | 2. | 3. | 4. | 5. |

**Comment:**

---

The results of those two weeks of monitoring are shown in Image 2.

**Image 2 – Results as were presented to the students from the Cohesometer readings over the two weeks of monitoring.**

V = very good (left), O = OK (middle), N = not good (right)
From Image 2 one of the most interesting findings was that the students responded as feeling V (very good) or O (ok) for the majority of the time. This was interesting for the students to see for themselves, as well as the teaching staff, as there seemed to have been a perception that the students were generally not feeling so positive. There were also some specific instances that showed up clearly on the Cohesometer. For example on the Thursday afternoon of the second week, there were the highest overall "very good" scores. The students reported this result because they had won the football tournament for their year. Monday afternoons also were both higher than the mornings. This may be because there was art on Monday afternoons. For the most part comments were also written by the participants next to the grading they had made. This provided a clearer picture of the reasons the students may have been feeling the way they were, at the time they recorded their feelings.

5. Discussion

The results from this study led to some important areas to be highlighted and discussed. These fall under the following categories; stress factors within a classroom environment, reflections for further study and possible directions for curriculum development and learning preferences of individuals.

5.1 Stress Factors within the Classroom

From the observations, conferencing, the Cohesometer and interviews, there were a number of factors that were consistently reported by members of the class as increasing their stress levels. Some of these factors were unable to be changed, as they were due to personal factors or were simply a part of life. However having an awareness of such factors as difficulties at home, tiredness, weather conditions and performance anxiety before tests, led to an feeling of empathy. This understanding of
one another then seemed to create more cohesiveness within the class. The children reported that they could understand better why someone was behaving the way they were. The teachers also said it helped them as sometimes the behaviour of the students was not a reaction to their teaching but something completely personal and independent from them. (from field notes).

Others factors that fell under the category of “possibly being alleviated” were such things as the physical layout of the classroom, the size of the classes or groups within the classroom, the noise level in the classroom, time pressure and emphasis on bad behaviour. The students and teaching staff expressed a belief that if some of these factors were changed then there would be a reduction in the stress levels within the classroom.

In looking further into research of stress in children, particularly in an educational setting there seems to be very little published about this subject. The majority of the studies are either about extreme, traumatic stress (Shakoor and Chalmers, 1991) or prenatal stress in relation to learning (Lemaire, 2000). This may be an area for further research as the affects of stress on academic performance in children seems to be quite a neglected area of research to date.

5.2 Awareness of Class Structure

Individual interviews were held with the teaching staff of the class. In these interviews the findings from the learning styles and Brain Dominance Profiles were shared and reviewed. The teachers responded to this feedback by changing the classroom layout, reinforcing positive behaviour more and implementing strategies to help students’ transition better.

These measures helped to reduce the stress in the classroom. The teaching staff also reported that they had a better understanding of what stressed the children, which in turn helped them in their class management.

Both members of the teaching staff also saw that by focusing more clearly on positive reinforcement methods they were encouraging a clearer understanding of the positive behavior that was expected of the class. This became the first step in giving the students an opportunity to take more responsibility for their own behavior.

5.3 Reflections for further study and possible directions for curriculum development.

One of the most striking and consistent findings in this study was the affect of “chill out time” and the importance of individual autonomic expression. This showed up consistently in many instances; self-reporting, group discussions, observations in the Cohesometer and even as a motivational tool for the students. This would suggest to teachers and developers of curriculum that situations where the students have the opportunity to have individual, relatively unstructured time is a very important area to be considered. It is also interesting to note that in other studies (Osborne, 1969; Hoffman, 2009) free time was so important that it could also be used as a positive reinforcer. This was also the case in this study.

Examining why free time is so important to the students could also elicit some interesting insights into what motivates children especially in an educational setting. As an aside it must be pointed out that the ‘chill out’ time for the teachers was often as important if the stress levels were relatively high that day.

This very consistent and very clear observation evoked a deeper look at ‘chill out time’. In reflecting on the nature of this chill-out time, it became clear that an important aspect was the element of autonomy. Autonomy has been shown to be an important motivational factor among company employees world-wide. (Pink 2010). This factor has also been shown in school settings. (Dweck, 1986) Providing the opportunity for children to exercise their own autonomy within an educational setting would appear to be a rising issue that should be addressed.

5.4 Learning Preferences of Individuals

From the results, it was shown that there was a large majority of the students who reported that they preferred to learn more by a tactile/kinesthetic modality. This was such a strong majority that it warranted further investigation. In speaking to professionals that are regularly testing for learning preferences, they reported that this sort of percentage (70-80% preferring the Tactile/Kinesthetic mode) was quite common. (Interview with “lerntrainerin”, April, 2011).
This was not to say that other modalities were ineffective within the classroom. It was reported by the students that their stress level was lower and they were more engaged in the lesson when they were able to receive information via their preferred modality. There have been numerous studies on the efficacy of teaching students through their preferred method of learning, with mixed results. (De Bello, 1990) Other studies have shown that there is a correlation but it is very difficult and sometimes even impractical to try to integrate this into a classroom setting (Felder and Silverman, 1988). The majority of the studies however conclude that a multi-modal form of learning was the optimal way to deliver information. (Boström, and Lassen, 2006).

What was also interesting from this study was that the students were genuinely interested in what their preferred mode of learning was. The sheer knowing of their natural learning style seemed to have an affect on how engaged they were in learning. They also expressed the desire to be able to learn more “their natural way”. These elements of understanding preferred style of learning and being able to play an active role in self-regulating the learning has been shown to have a positive effect upon academic performance. (Pindrich and De Groot, 1990)

There has been little research into the role learning preferences play on the levels of stress associated with learning, particularly in the primary school age group.

Notes
Modal Preferences in Creative Problem Solving
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Modal Preferences in Creative Problem Solving

Key Words:
Creative Problem Solving, play, thinking, embodied cognition.

Abstract.
Embodied cognitive science appeals to the idea that cognition depends on the body as well as the brain. This study looks at whether we are more likely to engage just the brain or enlist the body for complex cognitive functioning such as creative problem solving. Participants were presented with a puzzle based on De Bono's lateral thinking puzzles. The puzzle consisted of rotating and joining two-dimensional shapes to make a three dimensional one. In one condition participants were given the choice of either solving the puzzle mentally or through manipulation of the images on a computer screen. In another condition the subjects had to solve the puzzle first mentally and then report which mode they would have preferred to solve the puzzle. Two more conditions were applied with slight variations. In all conditions an overwhelming majority of participants chose to solve the puzzle by manipulation, even though there was not a significant increase on performance. It appeared that participants were making a conscious choice for the body to play a feedback-driven role in creative cognitive processing. This strong preference for manual manipulation over just mental representation, regardless of the impact on performance, would seem to suggest that it is our natural tendency to involve the body in complex cognitive functioning. This would support the theory that cognition may be more than just a neural process, that it is a dynamic interplay between body, brain and world. The experiential feedback of the body moving through space and time may be an inherently important factor in creative cognition.

Introduction
In the 1950s and 60s research of creativity and insight came to be dominated by an information-processing approach, linked to developments in Artificial Intelligence (Mayer, 1999.) According to this view, creativity was a product of the mind instantiated in the neural processes of the brain. More recently, however, considerable debate has been generated about the precise location of the mind, and whether it is situated in the brain (Noe, 2009; Clark, 2008; Hameroff, 2007). The implications of so-called 'extended' or 'enactive' theories of mind are potentially important for topics like creativity as they introduce the idea of interplay between the brain, body and environment.

Bohm and Peat (1987) talk about play and interaction with the environment as being important aspects of creativity. The idea of interaction with the world at large having an impact on cognitive activities is also being proposed in contemporary theories of the mind (Noe, 2009). Merleau-Ponty (1962) argued that perception and representation always occur in the context of, and are structured, in the course of a person's on-going purposeful engagement with the world. Embodied cognitive scientists are proposing that cognition deeply depends on the involvement of the body in sensing and acting as well as being neurally instantiated (Varela, Thompson and Rosch, 1991).

Thelen and Smith (1994) offered a challenge to cognitive developmental theorists by applying a dynamical systems theory to developmental psychology. They stated that novel behaviours could be generated through bodily activity. Thelen and Smith were also proposing that there is an aspect of development that was emergent and self-organising. Meaning to say that bodily involvement can come before mental representation in some instances.

Embodied cognition also seems to be appearing more in the area of art theory and practise. "For instance Hockney talked about his reflective process in which; he asks and makes theories only after, and not before, having done something". (Sullivan, G 2011, p.117) This element of first experiencing physically and then developing a cognitive representation would appear to support the theory of embodied cognition.

Background
The idea for this study came initially from observations of children. In working with children for over ten years, consistent patterns of behaviour had started to emerge. One of the most prominent behaviours is this natural tendency of children to want to touch, manipulate or play with the objects involved in their learning (Pepler, 1982). This tendency was so strong that we started asking the question of whether adults still had this tendency, especially in the area of creative problem solving. We decided to start exploring preferences by asking whether the adults preferred playing with objects on a computer screen to solve a creative puzzle or by solving the puzzle ‘in their heads’.

Methodology

There were a total of 60 participants involved in this study, the majority of who were from the Product Design Course of a University. In total there were 38 male and 22 female participants. Specific ages were not asked in the consent form, but the participants in condition 1 and 2 were design students and tended to be under 30 years and the participants in conditions 3 and 4 were from different backgrounds and tended to be over 30 years of age.

Participants were asked to sit in front of a computer monitor where they were presented with a puzzle on the screen. This puzzle was based upon a lateral thinking puzzle from De Bono (1977). There were three shapes, which were two-dimensional and they were instructed to create a three dimensional shape from these three individual shapes. See Figure 1 below.

![Fig1. The three shapes presented to participants](image)

The initial design had only two conditions:

Condition 1: participants were allowed to choose at the onset which method they would like to use to solve the puzzle – either in their heads (thinking) or by using the mouse to rotate or move the shapes (playing). They were timed as to how long it would take them to create the three dimensional shape.

Condition 2: participants were asked to solve the puzzle in their heads and timed as to how long they took to solve the puzzle. They were later asked which mode they would have preferred to use if they had been allowed to choose at the onset– either in their heads (thinking) or by using the mouse to rotate or move the shapes (playing).

Whilst conducting the study for these two conditions it became apparent that there were two issues that were not ideal in obtaining clear results.

- The majority of participants were design undergraduates and therefore found the puzzle to be quite easy to solve.
- The manual manipulation of the shapes on the computer screen by using the mouse was a
little difficult and the actual moving of the shapes was having a negative affect on the solving time performance.

In response to these limitations two more conditions were introduced to the study:

Condition 3: Participants were allowed to choose at the onset which method they would like to use to solve the puzzle. They were asked to tell the experimenter when they had solved the puzzle. If their verbal response was correct, even though the actual shape had not yet been made, the verbal response was time stamped as the performance time.

Condition 4: Participants that were not design students were selected for this condition and were allowed to choose at the onset which method they would like to use to solve the puzzle. They were asked to tell the experimenter when they had solved the puzzle. If their verbal response was correct, even though the actual shape had not yet been made, the verbal response was time stamped as the performance time.

Once the participants had completed the initial problem-solving task, they were then asked to fill out a questionnaire about their problem solving preferences.

Results

Table 1: Percentage of participant’s modal preference and their performance across the four conditions.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Play Mode preference</th>
<th>Puzzle Solved</th>
<th>Think Mode preference</th>
<th>Puzzle Solved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>93.75</td>
<td>86.7</td>
<td>6.25</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
<td>n/a*</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>81.25</td>
<td>84.6</td>
<td>19</td>
<td>66.7</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>66.7</td>
<td>20</td>
<td>33.3</td>
</tr>
</tbody>
</table>

* Participants in this condition were unable to choose this mode to solve the puzzle, they could only state their preference after they had completed the task.

Overall:

Of the people who had a choice, 85% chose to play.

95% said they would have preferred to have the ‘real’ shapes to the other two options of solving the puzzle.

For those who played: 80% got the answer correct. The people with the correct answers took on average 72.1 seconds to solve the problem correctly. Standard deviation = 52.3 seconds

For those who thought: 70% got the answer correct. The people with the correct answers took on average 43.8 seconds to solve the problem correctly. Standard deviation = 20.9 seconds

Discussion

In all conditions there was an overwhelming preference of participants to want to use manipulation (play condition) as shown in Table 1. According to Slovic “The expression of preference by means of choice and decision making is the essence of intelligent, purposeful behaviour “ (1995, 364). What is this overwhelming preference to manipulate the shapes via a computer mouse telling us? It seems to be informing us that our natural tendency is to interact, even indirectly; with the world we are in. “Biological brains are first and foremost the control systems for biological bodies. Biological bodies move and act in rich real-world surroundings” (Clark, 1998. 506). In this study the bodily information was not directly related to the problem solving of this creative task, i.e. the participants did not manipulate the actual physical shapes. There was, however, secondary visual feedback that was informing the participant as they tried to solve the task.
Contemporary embodied cognition theorists have categorized personal experience into two areas: on-line and off-line embodied cognition. On-line cognitive activity is seen as task-relevant, the mind can be seen as operating to serve the needs of a body interacting with a real-world situation (Wilson, 2002). “Off-line aspects of embodied cognition, include cognitive activities in which sensory and motor resources are brought to bear on mental tasks whose referents are distant in time and space or are altogether imaginary. In these cases, rather than the mind operating to serve the body, we find the body (or its control systems) serving the mind” (Wilson, 2002, 635).

Our findings seem to support this definition of personal experience: that involvement of the body, even in an indirect manner (or off-line mode) was the preferred method of solving the creative problem to using only mental representation. What was also interesting is that the motivation for wanting to play with the objects even indirectly was not about necessarily enhancing performance. Findings from another study we conducted recently looking deeper into the role of play showed that non-related play significantly outperformed direct manipulation of materials in solving a creative task (Loudon et. al. 2012). In that study we suggest that the interaction with environment may not only be a way of obtaining information but may also have something to do with a person’s “state of being.” Therefore the preference shown by the majority of participants from this study may have been motivated by an inherent natural tendency.

The findings from this study have shown that there is a very strong preference for people to interact with their external environment, even if the physical feedback is not directly related to the task at hand. This desire for bodily feedback tends to suggest that interaction with an object is our natural preference in solving complex problems. This study would appear to not only support embodied cognition theories but also begin to show that embodied cognition may well be our natural preference. It would be very interesting to look further into why we seem to have such a strong preference for interacting with our environment.

Limitations

A very practical issue that is mentioned in the methodology section of this paper was the difficulty of moving the shapes on the computer screen. The software program could be developed so that the shapes are more easily moved to create the three dimensional shape. A suggestion by one of the participants was to use a touch screen, as a more direct way of moving the shapes.

Another area to consider if this study were to be replicated would be to use more than one puzzle. This particular puzzle was a De Bono lateral thinking puzzle related to creating shapes. Many of the design students were familiar with this type of problem. Perhaps using one or two different problems that were not just geometric would provide more information about complex problem solving preferences.

Further Research.

One very important area that emerged from this study was this strong preference for wanting to have the physical object to “play” with in order to solve the problem. A worthwhile area to investigate would be the role that physical objects play in relation to creative problem solving. It would also be interesting to investigate further the reasons for this preference to want to ‘play’ with physical objects and whether the objects need to be directly related to the creative task.

References.


PLAY, AUTONOMY AND THE CREATIVE PROCESS

Abstract: Play has started to be recognised as having an effect upon the creative design process, but mainly in terms of playing with prototypes. In this study we explore play a little further to understand more about the type of play and its effect upon the creative process. We look at physical, imaginary, social and non-related play, in relation to solving a creative problem. Surprisingly the highest and fastest scoring condition was the non-related play condition. This would suggest that there is more going on than just iterative feedback, when a person is playing in the creative design process. Relatively new research has started to show that play may also be important because of the intrinsic motivation that is inherently part of the nature of play. This intrinsic motivation and elements of autonomy have also been shown to have an affect upon people’s feelings of well-being. This study supports the idea that play may be even more important to the creative process because of the affect it has upon a person’s state of mind.

Keywords: play, autonomy, creativity

1. Introduction

Stuart Brown (Brown and Vaughan, 2010), Michael Schrage (Schrage, 1999) and Tom Kelley (Kelley and Littman, 2002) contend that play is an important aspect of the creative process. Sutton-Smith (1966, 1992) stresses the role of play in the development of flexibility in problem solving. We are interested in why play is an important aspect of the creative process. In a previous study (Loudon and Deininger, 2011) we explored the role of play and prototyping in creativity. The results of that study raised the following questions:

- Does play support creative problem solving?
- Does play need to be related to the task at hand?
- Does the form of play affect the creative problem solving performance?

The aim of this study is to try and answer these questions. In looking at the question of whether play needs to be related to the task at hand we are actually asking the question of whether the role of play is directly connected to prototyping or whether there is something deeper going on.

2.1. Play as an altered state
Stuart Brown (Brown and Vaughan, 2010) describes play as being an altered state, exploring the possible in which joyful emergence occurs. Csikszentmihalyi (1996) describes the concept of ‘flow’ during the creative process where people have the feeling of things as “almost automatic, effortless, yet highly focused stated of consciousness”. Csikszentmihalyi highlights nine elements of flow: There are clear goals every step of the way; There is immediate feedback to one’s actions; There is a balance between challenges and skills; Action and awareness are merged; Distractions are excluded from consciousness; There is no worry of failure; Self-consciousness disappears; The sense of time becomes distorted; The activity becomes autotelic. These ideas of play as putting a person into an altered state or as being an aspect of the Flow experience suggest that there may be a deeper element to play. In previous studies we have been looking at the affect of ‘state of being’ upon creativity (Deininger and Loudon, 2011). This study may shed more light on the link between play and creativity in terms of ‘state of being’.

2. Methodology
To explore whether play supports creative problem solving and if the form of play is a factor in creative problem solving we chose to use Duncker’s candle problem (1945) as the creative problem solving challenge. Duncker’s candle problem has been used in a wide variety of psychological studies and is accepted as a good creative problem-solving task. In this task the participants sit at a table next to a corkboard. On that table are a candle, a box of drawing pins and book of matches. The task is to attach the candle to the wall, without wax dripping onto the table when the candle is lit. We modified the task because books of matches are not so easily available and boxes of drawing pins no longer come in cardboard boxes as described by Duncker. Therefore we provided a standard (cardboard) box of matches, a candle and a handful of loose drawing pins. See figure 1 below.

![Figure 1. The candle, box of matches and drawing pins used in the task](image)

The task was then presented in written form and participants were allowed to write or draw the solution. Fifty participants were selected from a larger group of undergraduates of the product design and architecture departments. Participants in the study had no previous knowledge of Duncker’s candle problem. Participants were randomly assigned to five different conditions to see what effect different forms of play had on solving the problem. Ten participants were in each condition.

These conditions were:
• Social Play: In this condition participants were allowed to communicate with each other via a Facebook application on their mobile phones. They were instructed not to talk to each other during the task.

• Imaginary Play: In this condition the participants were given the task in the form of an imaginary story. The imaginary story was:

   Once upon a time you went into an enchanted forest. You went there because you had heard that there was a magic castle on the other side of this forest. You had decided that today was the day you would go to that castle. As you entered the enchanted forest you saw bushes filled with lovely berries to eat. You felt hungry but decided not to stop and pick the berries. You came across lovely patches of soft green grass but you did not lie down on them, as you were determined to get to the castle. You even saw playful pixies trying to tease you into chasing them. But you kept going through the forest. Eventually you came out the other side of the forest and before you stood a rather grand but rather strange looking castle. It was not round but not square either. It was quite tricky to find the entrance but being rather clever, you ended up finding how to enter the castle. After you entered you found yourself standing in front of a magnificent spiral staircase. You decided to climb the staircase. At the top of the staircase was a cosy little room. Feeling rather tired by now you went into the room to see if there was somewhere to sit. Standing in the room was a wise old wizard, and he said, “Ah, I have been waiting for you.” He continued, “You have shown that you are perhaps worthy to be my apprentice. You have passed through the enchanted forest without being distracted or tempted to stay. You have found the entrance to the castle and you were brave enough to climb the spiral staircase and enter this room. Now you have just one more task to complete which will show me that you are meant to be one of my apprentices. And of course you answered “What must I do, oh great and wise master?” The wizard points to a table. On this table you have a candle, a box of matches and some drawing pins.

• Non-Related Play: In this condition, before being told of the task, participants were asked to take part in a game that was not related to the challenge. The game used was the ‘Human Knot’. In the ‘Human Knot’ game all of the ten participants were asked to stand in a circle. Then, each person was asked to place their hand in the middle of the circle and to grasp another person’s hand – then they do the same with their other hand, ensuring that they take the hand of a different person. The group then tries to unravel the ‘Human Knot’ by unthreading their bodies without letting go of each other’s hands.

• Physical Play: In this condition the participants were given the actual materials (the candle, the box of matches and the drawing pins) to manipulate in order to help them solve the problem.

• No Play: In this control condition, participants were just given the written instructions and asked to solve the problem.

All participants were given a maximum of five minutes to complete the task. All participants attempted the task and recorded their solution independently. The time taken for each person to complete the task was recorded. If the solution was not completed within the assigned time, it was recorded as a time of 5 minutes.

3. Results
Figure 2 below shows an example of one participant’s correct solution. Figure 3 shows an example of another participant’s incorrect solution.

**Figure 2.** An example of a correct solution to the problem

**Figure 3.** An example of an incorrect solution to the problem

In terms of the social play condition only a limited amount of conversation took place on the Facebook application. See Figure 4 below. Some ideas were shared on how to solve the problem. It was observed that participants were also using the Facebook application for their own personal use. It was reported by the participants that there was not enough time to use the Facebook application effectively.

**Figure 4.** The Facebook conversation amongst participants in the ‘Social Play’ condition
Figure 5 below shows the overall number of correct solutions for each condition. The ‘Non-Related Play’ condition and the ‘Social Play’ condition had the highest number of correct solutions (6 out of 10). The ‘Physical Play’ condition had the next highest number of successful solutions (4 out of 10), followed by the ‘No Play’ control condition (3 out of 10) and then finally the ‘Imaginary Play’ condition (1 out of 10).

![Number of correct solutions](image)

**Play Conditions**

**Figure 5.** The number of correct solutions for each condition

Figure 6 below shows the average completion times, in seconds, (including 95% confidence intervals) for each condition. The results show that on average, participants in the ‘Non-Related Play’ condition had faster completion times ($M = 141$, $SD = 31$) than participants in the ‘No Play’ condition ($M = 233$, $SD = 74$), the ‘Imaginary’ condition ($M = 270$, $SD = 51$), the ‘Physical’ condition ($M = 252$, $SD = 101$), and the ‘Social’ condition ($M = 252$, $SD = 79$).

![Average completion time (secs)](image)

**Play Conditions**

**Figure 6.** The average completion times for each condition

The completion times were analysed using a univariate analysis of variance between two conditions at a time. Note that we used an alpha level of 0.05 for all statistical tests. Table 1 shows that there was a significant difference between the Non-Related Play condition and all other conditions.
Table 1. Significance of differences between completion times of ‘Non-Related’ Play condition with other conditions

<table>
<thead>
<tr>
<th>Conditions</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Play</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imaginary Play</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Play</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Play</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Discussion

After analysing the results it is clear that the Imaginary play condition had the lowest performance both in correct solutions and completion time in relation to the no play condition. There is no clear indication as to why this may be the case. One possibility could be that the story did not clearly communicate the task. Another reason could be that there was a large amount of text to read, which may have been strenuous for some students.

The physical play condition had a higher number of correct solutions and a longer average completion time in relation to the no play condition. Even though the number of correct solutions was higher than the no play condition it was only marginal. This condition is closest to a prototyping process therefore it was somewhat surprising that there was only a marginal difference in performance, in relation to no play condition. Prototyping is largely regarded as one of the fundamental elements of the design innovation process therefore we would have expected a much higher number of correct solutions.

The social play condition had a higher number of correct solutions and a longer average completion time in relation to the no play condition. This was not expected, as there was only limited amount of interaction through the Facebook page. It had also been observed that the participants were distracted by going onto their personal Facebook pages. Perhaps this distraction was also a factor in the creative problem solving performance. Wallas (1926) and more recently Dijksterhuis and Meurs (2006) have established that the element of distraction can have a positive affect upon creativity. It could also then be said that this form of distraction may be another type of non related play.

A surprising result was that non-related play had a higher number of correct solutions and a much shorter average completion time, in relation to the no play condition. The question is why? Stuart Brown and Csikszentmihalyi have touched on the idea that play may be linked to an altered state. From the definition of Flow there seem to be three particular aspects that are present in the non-related play condition. These are; there is no worry of failure, self-consciousness disappears and the activity was enjoyable. What may be emerging is that the non related play activity was not only enjoyable but was free of performance expectations. Deci and Ryan (1985) “suggests that the concept of flow represents a descriptive dimension that may signify some of the purer instances of intrinsic motivation.” To be truly intrinsically motivated a person must also feel free from pressures, such as rewards or contingencies. The concept of intrinsic motivation is simply another way of saying that people are interested and enjoy what they are doing. (Cameron, 2006). Controlling extrinsic motivation has been found to be detrimental to creativity. (Amabile, 1996) It has also been suggested that intrinsic motivation occurs when action is experienced as autonomous or self-determining. (Deci & Ryan, 1985). It would seem that non related play displayed the characteristics that define an intrinsically motivated activity.

If we look at both the non-related play and the social conditions, both exhibited an element of autonomy because they were not related to the task at hand. This autonomous element has often been related to prototyping exploration (Schrage, 1999). However, researchers have also found a link between autonomy and overall well-being (Pink, 2009). This would suggest that autonomy could also be related to the ‘state of being’ of the person carrying out the creative task. In previous
studies we have found that ‘state of being’ does play a role in the creative process. (Deininger and Loudon, 2011). ‘State of being’ seems to be more of a factor in the current study than prototyping itself. The findings of this study seem to suggest that a non-causal relationship is having a greater affect upon the creative process than a causal one.

5. Future Research

This study has highlighted a very interesting, possible link between play, autonomy, state of being and creativity. We plan to explore these possible relationships more deeply at a quantifiable and qualifiable level in future studies.

References