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Issues in Teaching Creative Thinking to Design Students

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Introduction

Interest in creativity has accelerated over the past decade. Between 1999 and 2010 more than 10,000 papers were published concerning creativity along with hundreds of books.[1] There are myriad explanations of creativity [psychological, neurological, sociological, etc.] and across disciplinary differences, a common object of address cannot be assumed. There are numerous creativity theories taking different perspectives on the sorts of creativity, from minor personal insight to universal genius, which, along with numerous definitions, domains, empirical methods, research orientations, etc., makes definition and classification difficult - one group of researchers has identified ten major categories of creativity.[2] In attempting to teach creativity, clearly one has to be selective in what one draws from this body of research and careful about how to integrate it into a coherent curriculum. If the primary intention is to help realise the creative potential of each individual then one searches for means of achieving this goal. In developing such a curriculum, individual differences in personality should be borne in mind, which implies that no one method of engendering creativity will be universally applicable and, therefore, a range of methods should be used. This paper argues for a pragmatic approach based on the simple precondition 'does it work?' to provide a yardstick against which methods may be measured. A selective appropriation of creativity theory can be shown to produce practical outcomes.

Design itself is a dynamic discipline where, at least initially, practice is informed by theory. The reverse may then occur, but to remain relevant the outcome must finally connect with practice. Teaching creativity to design students needs to reflect this approach and therefore the search for final definitions — if indeed there is any such thing when so much about the subject is contingent — is not its goal. Against a backdrop of a collapsing ecosystem, this paper argues for a rethink of an education system that is educating for the past instead of the future. It goes on to consider types of creativity along with some form of working definition, how training can enhance creativity and how an understanding of neurological processes may suggest ways to enhance creative insight. The power of metaphor and the unconscious is touched on and finally, it looks towards directing the minds of students to a Design Futures focus.

The Creative Challenge of 'Now'

From an educational perspective, there are contingencies associated with teaching creative thinking that have barely been considered in the scramble to jump aboard the freewheeling creativity juggernaut, where creative ideas may lead to negative consequences.[3] For example, environmental consequences tend to be side-stepped by those espousing the 'creative economy' approach. If the fostering of creativity in education is a response to changing global market forces, where a 'disposable' culture is dominant, then how are educators implicated in this unsustainable endeavour?[4] The growing and distribution of food, fuel, minerals, textiles and other necessities [and luxuries] of life are all now matters of pressing concern given the difficult and uncertain future we face as a consequence of the effects of over-population and climate change[5] and one observes with growing incredulity and dismay how governments worldwide refuse to adequately address such a fundamental concern. The insatiable demand for more energy to produce more material goods, driven by a globally pervasive consumerist economy, provides the backdrop against which creative thinking becomes an absolute priority. Individually, and as a species, we must respond to this situation before it overpowers the ability of the earth's ecosystem to recover. This has to start with each of us accepting there has to be other ways to create and enjoy a civilised existence besides our present suicidal predicament. The concept of designing for a truly sustainable future is only now gaining traction and has been described as 'design futuring'[6] and encompasses a global project termed 'The Sustainment'. The

Sustainment transcends 'sustainability' and will occur when 'continual material and cultural change keep what sustains in dominance.'[7] This vision needs the creative thinking skills essential in developing the resilience needed to survive-and even thrive-in thisvolatile and uncertain future.

De-schooling and Design Futuring

Creativity is implicated in an attitude that accepts and embraces change as an inevitable and inherent part of twenty-first century life.[8] Creativity has been recognised as a key factor in driving civilisation forward and its study seen as a basic necessity[9] but this is not the same as simply inventing and developing more goods and services in themselves with the sole objective of making money. From a futures viewpoint creativity may be valued if it leads to alternative solutions to the issues confronting humanity and the earth's ecosystem through invention and innovation. This should not be taken as applying primarily to the making of more things, rather as to how we might re-invent our concept of the material world and recast the direction of our thinking. It has to begin at a personal level. For many people, developing their creativity leads to a more fulfilling life experience. This approach accepts Rogers' contention that everyone has the capacity for self-actualisation and should be provided with the means to achieve it.[10] It begins by changing prevailing, predetermined patterns of thinking and this begins with de-schooling. By this I mean unlearning constraining attitudes and behaviours so as to re-learn a more appropriate mindset.

Schooling exerts a powerful normalising influence over society through the pressure to conform and there are serious concerns over the impact of the education system on the creativity of young people.[11] Schooling makes it clear to children what is and is not acceptable behaviour, reinforcing this through a system of rewards and punishments. Fortunately for all of us, some individuals survive this process without conforming and these are frequently the very people who end up making major original contributions in many fields of human endeavour. In making this observation I am not condemning teachers, many of whom devote their lives to nurturing talent and self-worth, rather a system that, in many of its key features, reflects nineteenth-century values with its emphasis on numeracy and literacy and by identifying the leaders from the led, a system that sorts students by academic values more applicable to a narrow industrial economy rather than to the realities of the twenty-first century.

What sort of creativity?

Teaching for creativity has little meaning unless one determines what sort of creativity is to be taught, in what context and to what extent. There are nearly always constraints to creativity defined by cultural, political and religious standards. Truly open-ended creative thinking may be regarded as a subversive activity since essentially it accepts no boundaries and disregards rules. How far 'outside the box' are students permitted to extend themselves before they come up against the confines of a larger container? How comfortable are teachers with creative thinking that stretches or exceeds 'the limits'? Teaching for creativity thus contains its own paradox: let's be creative, but not too creative.

Creativity comes in a variety of forms, so the focus of a course in creative thinking should be on how to reignite in all students a belief in their own personal creativity and then to provide a structured approach to helping them develop and expand their creative thinking. There are conflicting pressures placed upon designs students to be innovative but also to conform to industry norms along with the imperative of finding a job upon graduation. Investigation and innovation, and challenging existing paradigms, should be the norm, but can easily turn into providing students with a toolkit of 'how to do it' techniques aimed at existing industry requirements. Consequently, the efforts of students [and teaching staff] are so often directed more towards the existing job market, and the skills needed to earn a crust upon graduation, than to exploring entirely new territory. This is a major dilemma. There is a massive gap between the state of the way things are and the way things will become. Students need the mental set that will position them to embrace the social, political and economic challenges concomitant with the upheavals of climate change. In this evolving environment, designers have a crucial role to play as leaders in remodeling the re-constructed world and how it communicates itself to the population. They should contribute through informed debate and provide direction by being proactive instead of reactive. This is a different level of thinking from that associated with being capable of responding to the client's brief. Education has to provide students with the tools and attitude to confront norms, undermine the unsustainable and allow space for critique and new directions. If this enterprise is to be assisted through creativity then it is encumbent upon us to consider what sort of creativity is appropriate and how best to engender it.

A small child makes entirely new discoveries and creates new ways of thinking and acting on a daily basis. As we get older, each one of us is likely to experience some level of personal creativity on a daily basis. Anything from

making a minor change to a cooking recipe and so improving the outcome, to consciously changing our attitude and response to the way we interact with others to become more receptive and helpful, thereby improving the lives of others as well as our own. When Mohandas Gandhi adopted a particular attitude and a way a responding towards others, however, the effect was to resonate around the world. This is clearly of a different order to being pleasant to the person at the check-out in your local supermarket. Robinson indicates the spectrum of what gets designated as creative:

> Creativity suggests originality: that the results are new. But how new? Do we have to come up with something that has never been thought of before? Common senses suggests not: that a creative outcome can be original on different levels: to the person involved – personal originality; for a particular community – social originality; and for humanity as a whole – historic originality.[12]

Consideration of the relative magnitude of creativity led to the postulation of: at first, two categories of Big-C and little -c by Boden; then three categories labelled as Big-C, little-c, and mini-c creativity; and, with the inclusion of pro-c, to four categories.[13] The category Big-C ['historic' or 'eminent'] refers to ideas that are wholly original and that produce a paradigm shift in a particular domain or even universally. Musicians such as Ludwig van Beethoven, painters such as Vincent Van Gogh, scientists such as Marie Curie and Albert Einstein, are some examples of Big-C creativity. At the other end of the scale mini-c creativity occurs at a personal level and includes all those small individual achievements such as adding an extra ingredient to a food recipe to make the result taste better, or trying different routes to commute to the workplace so as to reduce travelling time. Mini-c creativity has been defined as, 'the novel and personally meaningful interpretation of experiences, actions, and events.'[14] Importantly, mini-c creativity reflects an entirely personal judgment. That is, you are assessing yourself as to how creative you have been. Such intrapersonal judging allows us to experience pleasure in any number of small, but personally significant, achievements. This is in contrast to other sorts of creativity which are judged by others, that is, interpersonally, and almost invariably against some form of established criteria.

In between the extremes lies little-c creativity, i.e., making a creative contribution at a local level. Examples might include a school band winning an inter-school music competition. While this is rewarding for the members of the band, their creative abilities are judged against other, relatively amateur participants. Pro-c takes this a step further by referring to professional creativity, subject to peer review, and this encompasses a wide range of ability. To continue the music analogy, pro-c would encompass a musician being acknowledged as the leading jazz trumpeter in a given country or a pianist winning a major international competition. It is quite likely this four part schema will be expanded in the future, but for the present it provides a useful means of categorisation.

Of especial interest is the proposition that later forms of creativity arise out of earlier little-c interpretations and this 'highlights the creative, transformative process involved in developing personal knowledge and insights.[15] This is consistent with the notion of 'ideational code-shifting' whereby successful creators must move beyond their own intrapersonal judgment and make their expressions of creativity meaningful and novel to others by crossing the divide from mini-c to little-c.[16] Teaching design students the heuristics of creative thinking should encourage and develop both creative ideational code-switching and a shift to more expansive categories of creativity.

Some form of definition

Teaching a subject implies you know what it is you are teaching, the reasons for teaching it, and that you have some means of knowing that learning has occurred. You need a curriculum, aims and objectives, and the means of assessing the extent to which the student has learned or benefited from the process. In these respects, teaching creativity is essentially no different from teaching other subjects, except that both definition and assessment have for long been problematic: for example, there is no single 'correct' answer rather more, or less, appropriate solutions. While assessment is a major area in its own right and therefore is not covered here, it is appropriate to provide an understanding of what is meant by the term creativity.

Any definition of creativity has to relate to context. Vague open-ended notions of creativity have no real meaning until they are contextualized.[17] Only then does it become possible to specify aims and objectives and to formulate means of assessing outcomes. Because the nature of creativity is inherently complex there is no single definition. Treffinger reviewed more than 100 different definitions.[18] The vast majority of definitions that have been proposed apply only to particular aspects of the subject.

Amabile offered the cautionary advice that an absolute definition is not necessary to study a topic, referring to

Kosslyn's statement that 'It is not necessary to begin with a crisp definition of an entity in order to study it . . . It is hard to define something one knows little about'.[19]

Amabile provided an explicitly operational definition:

> A product or response is creative to the extent that appropriate observers independently agree it is creative. Appropriate observers are those familiar with the domain in which the product was created or the response articulated. Thus, creativity can be regarded as the quality of products or responses judged to be creative by appropriate observers, and it can also be regarded as the process by which something so judged is produced.[20]

The difficulty in attempting a one-size-fits-all definition is reflected in a recent review of the field, which commented: 'Although most researchers and theorists agree that creativity involves the development of a novel product, idea, or problem solution that is of value to the individual and/or the larger social group, psychologists have had great difficulty finding consensus as to definitional components that reach beyond these two criteria of novelty and appropriateness [value].'[21] Although there is no single, generally accepted definition, Amabile's [1996] definition offers a workable basis, even though there is no reference to the cultural setting.[22]

Heuristics and problem-finding

Techniques that focus on solving problems seek relevant connections and avoid and discard what might be termed conceptual noise, which is a very efficient means of obtaining a solution. Such methods may easily tend toward an algorithmic approach to keep on track and focused. However, when one is searching in a more open-ended way for 'what if?' ideas and unlikely solutions, the automatic elimination of many possibilities is likely to be counterproductive. Thus, Amabile's view of creativity as 'a novel, appropriate response to a heuristic (or open-ended) task' is more applicable.[23]

Problem-solving was, and in many ways still is, synonymous with creativity. While problem-solving is clearly an important aspect of creativity, just as important, if not more so, is problem-finding. The difference lies in simply noticing a problem exists and proactively defining and redefining a problem to make it operational and workable.[24] Frequently, it is the person who finds and defines her/his own problems who produces truly original outcomes. This is why problem-finding should be encouraged in students, as noted by Getzels and Csikszentmihalyi.[25] An enquiring mind, along with tenacity—to persist in the face of difficulties and failure—is something of a prerequisite. Most design students have these qualities to a greater or lesser degree. What they need is guidance in learning how best to apply them. Carefully designed creativity training, combining divergent and convergent thinking that incorporates heuristics, has been shown to increase levels of creativity and creative self-efficacy.[26]

Risk, memory &insight [intuition]

Risk is inherent in creativity, expressed in the equation, creativity = risk, and it is essential to give students the confidence to step into the unknown. Equally important, it should be added, is the avoidance of reckless risks. A valuable means of encouraging risk-taking is by incorporating some form of randomness in the process of exploring and developing an idea.[27] This is achieved by making unlikely connections. Sometimes the results have no applicability while at other times, and surprisingly quite often, wholly unforeseen results are arrived at that produce original outcomes. Many popular exponents of creativity promote this sort of random association. Recent research in neuroscience suggests we may be better served by training our brains to shift rapidly between associative and divergent thinking rather than separating the process into the either/or of associative or divergent thinking. That is, not by injecting randomness but by exploiting the associative structure of our memory network

Both associative [divergent thinking] and analytical [convergent] thinking are essential to the creative process. Creative insight is a combination of associative and analytical thinking, of recombining sometimes quite disparate elements to make new patterns which may then be interrogated. Since associative thinking relies on memory to find the necessary associations the functioning of memory is crucial to creativity. In terms of memory, the role of working memory is vital to holding the content of consciousness and therefore to the combination of associative thoughts that produce creative insight. Working memory is 'a monitoring system of ongoing events that temporarily keeps in mind information that is relevant to the situation, so that one can "work" with it.'[28] Dietrich has proposed four basic types of creative insight that result from two processing modes, deliberate and spontaneous, crossed with two knowledge domains, emotional and cognitive to produce a neural grid. These broadly reflect the associative and analytical

thought processes. Gabora uses the term contextual focus to describe the capacity to shift quickly and smoothly between analytical and associative thought. Gabora refers to neuro-scientific support for this view that suggest mind-wandering has a utilitarian function since this mode of thinking accesses the prefrontal and executive memory networks. There is a relationship between the state of an input and the location where it gets encoded. An episode stored in memory may respond to stimuli that are somehow similar to it, that is, content addressable. It is very important to creativity that memory is distributed across neural cell assemblies and is content-addressable: relevant items are retrieved and easily combined. Gabora explains that because creative individuals are more likely to have flat associative hierarchies they notice things others do not and retain the memory of these things.[29] Associative hierarchies refer to the number of associations we make between things. A steep hierarchy will make few associations whereas a flat hierarchy makes many. Cell assemblies that encode particular experiences are referred to as neural cliques.[30] Gabora describes a type of neural clique she terms neurds: 'Creative insight is accomplished by recruiting neurds: neural cliques that respond to abstract or atypical aspects of a problem, task or situation.' Thus unlikely and novel connections are made between disparate elements because neurds respond to remote or apparently unconnected features of the situation and thus draw new features into how the problem may be conceived. Gabora postulates that creativity is not only a matter using both divergent [associative thinking] and convergent [analytical] thinking, but also the capacity to spontaneously shift between the two as the situation requires.[31] When this process produces an insight attention is then focused on how this may be applied to the situation.

Metaphor and the unconscious

Memory lies at the core of dreams and dreaming. It is where images, emotions, sensations and experience is stored and from where the stuff of dreams is extracted. In dreams our unconscious exposes itself to us with all the absurdities, fears, desires and inhibitions that mostly avoid conscious scrutiny. Or maybe, as some research suggests, merely a distorted replay of events that occurred during the day when we were awake.[32] Either way, subjectively it really is another world, a personal parallel universe that we all carry with us as an intrinsic part of our psyche. The unconscious has been considered the well-spring of creativity.[33]

Memory also is fundamental to intuition, which relies on mixing existing information into new and unexpected combinations. This is where the metaphorical transcends the literal, where time is different, where divisions between the physically possible and impossible blur and dissolve. It is where disparate ideas combine in wholly unexpected ways to generate entirely unlikely, unforeseen and remarkable outcomes. '. . . associated combinational creativity during altered states such as dreaming or daydreaming can play a vital role in the creative process for the arts and the sciences.'[34] Our conscious and unconscious mind is a sea of metaphor—we interpret our world through metaphorical association. The use of metaphor has a profound effect on our thinking when, for example, we use allusions of conflict in how we describe argument.[35] It has been suggested that, to a considerable degree, the metaphors we use frame the way in which we conceptualise our world.

What is clear is the power of the unconscious to find connections that are not immediately apparent and to recombine these into new patterns that produce creative insights. This supports the need to allow time to mull over a problem, a period of incubation, and is the basis for the advice to 'sleep on it' given to those who are attempting to solve an apparently intractable problem. Accessing the unconscious has produced much creative output in the arts with the surrealists being prominent in this regard. It appears possible to access the unconscious through techniques that have been used in teaching drama.[36] It is possible that some of these techniques allow for Gabora's neurds to kick-in and provide creative insights. Thus reflection, introspection and indulging in metaphorical allusion are conducive to creativity and this is not time wasted. Indeed, conscious reflective rumination assists the creative process.[37]

Conclusion

The profligacy of humanity in exploiting every last shred of the earth's resources without regard for the future, which is also implicated in human-induced climate change, has been termed 'Defuturing'.[38] It is essential to provide designers with the mental skills to respond to the challenges posed as a consequence of defuturing and to bring fresh thinking and innovative ways of tackling the situation. As Fry has outlined half-measures are nowhere near solving the immense problems confronting humanity and the only sensible approach is a seismic change in attitudes.[39] A change of mind is more likely to occur if there is the means to help make this happen. The pervasive power of the designer cult [ure] presents the design profession with a phenomenal opportunity to be in the vanguard of such a change. Changing the minds of designers can begin the moment they commence their professional

studies.

First year students in tertiary studies are the product of an education system that places high value on fact-finding and analysis and where daydreaming and exploring the unknown is swamped by the demands to follow a narrow curriculum. One of the first things they can benefit from is to be de-schooled—to be encouraged to change attitudes and to re-learn the wonder, curiosity and excitement we all had as children. At the same time, they need to be supplied with the mental tools that allow them to develop their creative capacities. This includes exercising associative and analytical thinking ability and especially by stimulating the ability to develop contextual focus. These exercises may be enhanced when students undertake a range of creative methods that can be applied to real-life problems. As Robinson says:

> The key point is that creativity is a process not an event. The nature of this process is personal to the individual, but it often involves waking and sleeping moments or unconscious ruminations as we do other things. For everyone, creative activity involves a combination of control and freedom, conscious and unconscious thought, intuition and rational analysis.[40]

As there is no single 'best' creative method: an approach that proves to be effective for one person may not be quite as effective for another. Therefore, students need to engage with a range of creative approaches to allow each individual to discover which methods resonate personally with her or him. They should be encouraged to apply this thinking and these methods to their ongoing studies and to critically reflect upon them by keeping a journal. This becomes a personal source of reference for them in the future. Creative thinking should be tackled holistically to integrate theory and practice and extend beyond the object to inform a designer's life. And daydreaming is not a waste of time-it may just provide some of the answers for designers to help save our planet!

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