CREATIVITY AND THE COMPUTER NERD

An Exploration of Attitudes

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Abstract: This study arises from our concern that many of our best art and design students are failing to make the most of the opportunities provided by IT because of their fear or dislike of computers. This not only deprives them of useful skills, but, even more importantly, deprives many IT based developments of their input.

In this paper we investigate the relationship between attitudes to creativity and to computers among students. We quickly discard an approach based on theories of personality types as philosophically and educationally problematic. An approach based on the self-concept of artists and designers, in relation to their own creativity and to their feelings about computers, offers more hope of progress. This means that we do not try to define the attributes of 'creative people'. Rather, we ask what creativity means to students of art and design and relate these responses to their attitudes to computers. Self-concept depends on how the subjects see themselves within society and culture, and is liable to change as culture changes. One major instrument of cultural change at the present time is the growth of IT itself.

We then describe a first attempt at using a psychological method - Kelly's Repertory Grids - to investigate the self-concept of artists and designers. It is hoped to continue with this approach in further studies over the next few years.

1. Background

The experience of teaching students how to use computers for their design work suggests that three clear and distinct attitudes towards computers exist within every group of new first years - enthusiasm, fear or disdain. As they move through the three years of their course, it becomes clear that the enthusiastic students - usually small in number and already skilled with computers - rarely develop into good designers. They develop their computer skills, but find it hard to use these skills to produce inventive design work. We dubbed this group 'the nerds', and while this may seem unkind it can be noted that some computer enthusiasts take this label as a positive accolade.

The students who produce the best work via computer by the end of the course seem to come from the initially fearful group. It takes them a long time to become proficient with the machines and many are unsure of their capabilities right into their third year, but through their own determination and support from staff they eventually become enthusiastic and produce impressive and extremely creative computer-based work. At the same time, there are many other good students who never overcome their fear or disdain and so fail to master an increasingly important area of expertise.

We hoped that if we could gain a better understanding of why some stronger students seem to have negative attitudes to computers we would be in a better position to help them overcome these attitudes.

2. Personality Types

Like much research into the nature of creativity, this study was approached initially in terms of personality types. We wondered if it was possible to establish opposing characteristics for a 'creative person' and a 'computer nerd'. This turned out to be a false start, but an interesting one, considering the approach we finally took.

The modern use of personality typing within the psychological study of 'individual differences' is largely associated with Carl Jung,[i]. By 1986, D J Treffinger was able to find 60 type measures for creativity.[ii] Jung established certain attributes by which individuals could be categorised which have been used to measure relationships between choices of career or life style and their 'personality type'. Robert Bruce [iii] offers a list of personal qualities for creative people including: Originality; Proficiency; Restlessness; Risk Taking; Aesthetic Taste; Evaluation. More recently, and for reasons closely related to the rationale for this study, David Durling [iv] has used personality typing to explore the subject of computer assisted learning in art and design. Following Jungian principles, he describes a correlation between personality types and a "root preference" for certain styles of activity within the subjects' respective occupations. From a sample of creative people - fine artists, designers and interior designers - Durling found that intuitive types, (91%) feeling types (70%) and a combination of both (65%) were highly represented. Similarly, he found an opposite typology within a sample of analytical persons eg business managers and mechanical engineers.

This approach to the analysis of creativity is evident in the literature on the management of 'creative people'. In 1988, Winston Fletcher asserted that these people tend to be '...insecure, egotistical, stubborn, rebellious, poor time-keeping perfectionists'.[v]

More recently, John Whatmore of the Roffey Park Management Institute has offered the opinion that:

'Creative people are different: they are sensitive, intuitive, experimentalist, non-conformist and concerned as much about the development of their skills and talents as about their organisation's objectives'[vi].

These qualities line up with the stereotype of a creative person which most of us probably carry around with us. They are likely to be quite distinct from the mass of people - if not visibly in their dress, then at least in their concerns and attitudes. They are positioned as an outsider from the mainstream of society, and given the right to comment on it. In an important sense they are *driven* by their creativity - their work is somehow evidence of an unstoppable force within them - a force of Nature [vii] - and enables them apparently to engage with the world in a tangibly more authentic way than the rest of us, often leaving an actual physical trace of themselves upon it. As Armstrong and Tomes suggest, [viii] this stereotype of the creative person derives directly from the romantic conception of the artist genius. This 'cultural narrative'[ix] is therefore not much more than 200 years old in its full form. It is nevertheless clearly still highly potent at this point in history.

What of the characteristics of 'a computer nerd'? This type is also well-established in the public consciousness. From an admittedly unscientific perspective, the extreme 'computer nerd' type seemed to be similar to that of sufferers from Asperger's syndrome - a form of autism. Sufferers from this condition have difficulty relating to people, problems with communication, and lack of imaginative ability[x]. They also hate change and need a predictable routine in order to function properly. They tend to do well and are sometimes prodigal in maths and computing because of the predictable nature of these subjects. Asperger believed that, although the extreme version of this personality type was disabling, similar characteristics existed within the 'normal' population. He even described his syndrome as 'an extreme form of maleness' [xi]. People with the less extreme version of the personality type are characterised as 'nerds' in many different contexts, and have a well known set of attributes - they are boring, they wear anoraks, they like trainspotting etc. Jay Griffiths finds the nerds at home among the Druids - 'A bounded, rule-governed and separate world appeals to a certain cast of mind, one nervous of circumstance and happenstance, one wanting to believe that Chance can be eradicated by ritual, rote, weather, magic or computing'[xii]. Using a computer the nerd does not have to relate to people, nor communicate with them directly. He does not need imagination because of the richness of his virtual world.

It did seem that the personality of a 'creative person' and a 'nerd' were fundamentally dissimilar, but it quickly became clear that this line of enquiry was likely to be unsatisfactory. It has been argued elsewhere [xiii] that the romantic stereotype of the creative person is likely to have distinct negative consequences for art and design students, if it is the only approach to creativity to which they have access. Personality typing tends to put people into boxes ('A creative person' or 'a nerd'), the implication being that they cannot get out of their box. It takes no account of the relationship between an individual's personality as defined in a personality type test, and their identity. An individual's personal or social identity can change, and education is presumably predicated on the possibility of change. To move from ignorance to knowledge, implies changes in self concept. The more far reaching is the movement, the more fundamental will be the change of self concept.

3. Concepts of Self

In fact there has been much critical assessment within psychology of the theoretical basis for psychometric testing [xiv] and there is an extensive psychological literature which contends that personal identity changes through time, and in relation to circumstances. The idea of the 'self concept' developed in psychology by Kuhn and Mc Partland (1954) and described by Zurcher (1977) may be useful here as it allows for change through time and from situation to situation:

".....this definition of the self concept has very real implications for the way we behave. It suggests that we categorise ourselves into social groups. It also suggests that we use different self - identifications in different circumstances." [xv]

This suggests that some of the self concept of a 'creative person' will therefore derive from their having adapted to their situation, having categorised themselves in relation to the social group they inhabit. If that situation demands that they be a 'creative person' with certain aptitudes and attributes, then presumably those aptitudes and attributes will become part of their self concept. The individual is therefore not an entity made once and for all, but rather has a permeable boundary with the outside world. Among the components of the world as it is experienced which are likely to bear on this self concept are the prevailing cultural narratives about creativity and creative people. It is these cultural narratives which permeate the individual's self concept and with which he or she engages in the process of building an identity for themselves as a creative person. It is possible that the nerd has also developed the status of a cultural stereotype with the ability to negatively influence the concept creative people have of computers in relation to their own identities. This is not addressed directly here, but may be a focus for future study.

The study of creativity in psychology has also moved on from the notion that it is a fixed and measurable component of the personality of certain people. Albert Runco [xvi] for instance stresses the importance of reviewing the values that guide the creative individual, and the elements of culture and education from which those values derive. Reviewing a long term project studying creativity and art students, Mihalyi Csikszentmihalyi [xvii] suggests a view of creativity which recognises the cultural, social and temporal context that defines the creative activity. Talking of an apparent 'epistemological weakness' of his *own* empirical studies into the creativity of art students he notes that:

'...it is possible that the relationships we found depend on time-bound conceptions of what is creative - a product of particular cultural and social conditions.' [xviii]

While Csikszentmihalyi calls this a 'systems view' of creativity - not 'what is creativity' but 'where is creativity' - it could perhaps be called a cultural or sociological view. It takes on the interactions between individuals, their domain, and their field of operations. In the case of this study, the individuals are art and design students, the domain is art and design practice, and the field is constituted by the art and design world, combined with all the living cultural mythology about what creative people are like. In other words, we are concerned not with what *causes* creativity - i.e. what makes one person more successful at having good ideas and making a success of them than another. We are interested in *attitudes* to creativity, in as much as they affect the degree to which individuals are able to make use of computers to produce art and design work which is judged to be of high quality. It is therefore

important for us to identify closely what we are calling the 'cultural narratives' about creativity. It is these narratives which are likely to have determined the self concept of the participants in this study. They are narratives which are likely to evolve, both as part of wider culture, and as part of the self concept of people in the 'creative' professions.

4. Creativity in Relation to Computers

A survey of the literature relating to creativity and computers appears to reveal a computer utopia, exemplified by articles with titles such as "Expanding human computer interaction by computer aided creativity"[xix] ,"Computers as stimulants for human creativity"[xx], "Micro-computers: How can they be used to enhance creative development?"[xxi]. Meanwhile the opposite view - that computers are at best useless and at worst dangerous for artists and designers - has been left to the outpourings of disgruntled opinion by self-confessed Luddites' such as Mike Press[xxii].

In fact, many of these particularly positive publications relate to attempts to use computers for 'Creativity Training'. These systems are currently in their infancy and appear to be of dubious value. In any case they do not address the attitudes of artists and designers to computers which is the main focus of this study. It is more useful here to consider the relationship of creativity to computers by considering the computer as either a 'Tool' or as a 'Medium' for creative endeavour.

The idea of the computer as a tool appears initially to be the more straightforward. Only the most rabid computer-haters would deny that it is extremely useful for mundane and repetitive tasks such as technical drawing. It has also become deeply embedded within some of the more creative aspects of the design process, such as the ubiquitous use of Apple Macs in Graphic Design. When concerns are raised about this - as they occasionally are - users are heard to say 'I am still the Designer. The computer is just another tool'.

This is a disingenuous claim on two counts. Firstly, the computer is a uniquely complex tool, or collection of tools, applicable to a huge variety of activities. Secondly, it could be said that there is no such thing as 'just a tool'. Artists and designers who think at all about their own creative processes know that the tools with which they choose to work have a profound effect on the results. The interplay between creative imagination, tool and medium is fundamental to the design process, and it could be said that the main purpose of design education is to encourage this interplay to take place with as much expertise and variety as possible. Joseph Wiezenbaum, in his seminal work 'Computer Power and Human Reason'[xxiii] points out that traditional tools have evolved over many years - in some cases centuries - to fit their function. In doing so they have taken on a larger role and come to 'symbolise the activity they enable'[xxiv]. Computers do not have this well-established history of meaning, and they are therefore often viewed with suspicion.

Nonetheless computers do have meanings, recently developed though they are, and these are central to this study. Edward Pope[xxv] finds it unsurprising that the computer is playing an 'increasingly significant role in contemporary art' because of the artists 'fascination and desire to play with a new tool'. In his view, 'the importance of such play cannot be underestimated' in moving a discipline forward. Robin Baker has surveyed the current and potential uses of computers across a wide range of disciplines and

has 'been unable to detect any fundamental problem with [the computer's] imaginative use'[xxvi]. He feels that its creative potential is now undeniable.

While designers might be most likely to think of the computer as a tool, artists might be equally likely to think of it as a medium, and the impact of a new medium on practice is likely to be even more profound than that of a new tool. The impact of the computer on current fine art practice is of particular interest in relation to ideas about authorship and about interaction. In some cases the computer seems to share 'authorship' with the artist - such as in the works of William Latham, where a computer programme capable of producing endless mutations of form is given certain parameters and then 'set off' to produce a 'sculpture'. This attitude to the computer as author can also been seen behind the misguided but still common reaction to a computer model of a design that 'Its been done by a computer so it must be right'.

Even more important are the multi-media packages which allow authorship of a 'work of art' to be shared not with the computer itself but with the audience. These packages are helping to move art practice towards a participatory model with wide-ranging effects. Pope expresses the hope that this change may enable art to recapture its social purpose, by restoring the its ritualistic significance and ameliorating the vicariousness of a culture centered upon the television[xxvii]. The development of the Internet is accelerating these developments, with more and more artists becoming fascinated by the opportunities presented by the Web for collaborative and/or interactive 'art works' which are continuously produced, altered and developed by thousands of individuals around the world. The physical trace of the artist, important to the expressionist tradition in art, is thus missing from the Internet. Similarly, the Internet's chancy and fluid character compromises the possibility of a definable and fixed identity for the art producer.

This changing attitude within fine art is not confined to those who work primarily with IT. Robert Wilson is typical of a new kind of artist who works across apparent boundaries - performance, music etc. - and values process and collaboration. C Tom Mitchell [xxviii] draws a parallel between this changing emphasis in fine art and the necessity of a user centred and collaborative approach to contemporary design, particularly in the field of design for information technology itself. Clearly, this collaborative approach to design has implications for the role which the personal qualities and attitudes of the designer can play in the process.

It may be, therefore, that the growth of IT is in itself helping to break down the romantic conception of the artist, and by extension of creativity, as a cultural paradigm. Information technology is acknowledged to be implicated in global change of many sorts, among them, shifts in the ways in which people live and the attitudes they have to how they live. [xxix] The growth of information technology is a part of global cultural evolution and is therefore available to influence judgements about the creativity of individuals. Given the far reaching effects of Information Technology, and the fundamental 'difference' accorded to creative activity compared to everyday life, it is likely to have a reflexive effect on judgements about the creativity of individuals.

These moves in art and design practice taken together with the global impact of IT in the form of the Internet are relevant parts of the evolution of culture. If Csikszentmihalyi's conclusions are accepted,

then this evolution is likely to insinuate itself into the conceptions of creativity which are held by the population at large, and therefore are held by students. No doubt there will be a time lag before the majority of art and design students show evidence of this evolution in their attitudes, though some more advanced students already do.

5. Method

The method which we adopted to try and investigate the self concepts of artists and designers was suggested by our psychologist collaborators, Paula Reavy and Peter Ashworth. They recommended to us Kelly's Repertory Grid technique which G.A. Kelly invented as a tool to monitor the effects of clinical therapy. He based it on his model of personality where individuals build their relationship to the world via a repertoire of 'personal constructs' - ideas and attitudes to the world. [xxx] The technique's roots in therapy shows how change is fundamental to Kelly's ideas. He used the repertory grid technique to measure the effects of therapy intended to change his patients.

Central to Kelly's Repertory Grid technique is the idea that the results are provided - elicited is the technical term - by the participants themselves, rather than the researcher. The technique self-consciously depends on the participant to supply the results from their own realm of personal constructs. The technique has been used extensively in a number of fields, including market research and educational research[xxxi]. It has also been used recently by an artist seeking to reflect on his own exhibition. [xxxii] Clearly, the emphasis of the technique on the participants' experience of life fits very well with the approach to creativity described above. Using such a technique, it is possible to elicit constructs about a particular field from an individual, or a group of individuals. Thus the technique can provide data which can be analysed either participant by participant, or across the group of participants.

Briefly, the process of using Kelly's grids goes like this. The researcher provides a list of 'elements', which relate to the field in question. They may be people, things, emotions, anything, depending on the enquiry. The list we used in the study appears at the top of figure 1 below.

	A practicing artist	A practicing designer	An illustrator	Painting	Washing up	Digital imaging	Reading	A sculptor	Woodworking	Computer modelling	A mountaineer	An inventor	Self	Ideal self	Drawing	A typist	
talent	4	4	2	4	4	4	2	4	3	4	4	3	4	3	4	5	hard work
actual	4	3	1	3	1	3	5	3	2	3	2	4	4	5	4	2	conceptual
digital	3	2	4	5	5	1	3	5	5	1	5	3	4	3	4	3	analogue
visual	2	2	1	2	1	3	5	1	1	1	1	3	4	3	4	3	textual
productive	3	4	2	3	1	5	1	2	1	3	1	1	2	2	3	5	reproductive
genius	2	2	3	3	5	3	2	3	3	3	2	1	3	3	3	5	ordinary
unskilled	4	4	5	2	1	2	4	3	4	2	5	1	3	3	2	5	skilled
imaginary	3	3	1	3	5	3	3	3	5	1	4	3	5	1	4	5	factual
creative	3	4	2	3	5	3	1	2	3	3	3	3	4	1	3	5	routine
anonymity	3	2	4	3	1	2	1	3	2	2	4	4	3	3	2	1	authorship

Figure 1

The participant is asked to choose three elements from the list - a triad - and say how two of them are similar to each other and therefore different from the third. In the example above, for instance, the participant may have chosen the three elements 'reading', 'a sculptor' and 'woodworking', where reading is 'textual' while the other two are 'visual'. This opposing pair is considered to be a 'construct' which was 'elicited' about the triad and was entered on the grid as one pole of a pair of terms.

In the next stage in the participant is now asked to rank *all* the elements in terms of the pair of terms just elicited, on a scale of one to five. You will see that there are 16 columns in the grid, each corresponding to one of the elements above. You will also see that three of the pairs of constructs are in *italics*. Here, the influence of the researcher shows itself, as these were constructs which we provided.

The final grid was arrived at after a process of structured interviewing of four students and the administration of a pilot grid to two others. This offered the participants ten elements, all of which were processes - some related to the production of art and design some not. Included among them were the 'processes' of art practice and design practice, which it was presumed would be understood to be undoubtedly 'creative'. Others of the elements were presumed to have a more debatable relationship to creativity, the most extreme among these being washing up. Several changes were made after the pilot stage. In order to elicit attitudes to creativity more clearly, the second draft of the grid design included three pairs of terms as supplied constructs - Talent / Hard work, Genius / Ordinary and Creative / Routine. The second design also used an expanded list of elements - sixteen this time - which included self and ideal self as well as personified versions of some of the elements on the previous list. Here we referred to 'a practicing designer' rather than 'design practice', to try to tie the results down to the participants' perceptions of their chosen career.

The final version of the grid was administered in sessions of about three quarters of an hour to ten art and design students. Of these, three are studying industrial design three packaging design, one metalwork and jewellery and three fine art.

6. Results

Three questions were devised through which the results were analysed:

1. Is using information technology perceived to be a creative activity?

2. Does the perception of self correlate differently with traditional art and design activities compared with IT-based ones?

3. What does creativity mean to the respondents?

Question 1. was answered by looking at the correlations between those elements which can be accepted as 'creative activities or roles' - painting, or a practicing artist / designer for instance - and the two forms of information technology which appeared in the list of elements - digital imaging and computer modelling.

Question 2. was answered by considering if there is a pattern in the correlations between the 'self' element and 'traditional creative activities', and 'self' and the IT elements.

Question 3. was answered by considering the correlations between all the constructs elicited and the constructs - both supplied and elicited - which relate to creativity.

It is important to note that the study did not attempt to draw conclusions as to the causes within the individual participants for the relationships found. Rather, we were concerned to describe the relationships in terms of key points found in the literature and the theoretical basis developed from them to posit causes within the cultural terrain that the participants occupy.

6.1. QUESTION ONE

The analysis of the grids showed positive or negative or no correlations between the elements. These correlations were different in detail, participant to participant, but some clear tendencies showed themselves. The results from most participants showed a marked tendency to positively correlate 'creative roles' such as 'a practising artist' and 'a sculptor' with each other, and with traditionally creative activities such as 'painting'. All the results except one show a positive correlation between computer modelling and digital imaging, while IT is almost always negatively correlated with at least one of the 'creative roles.' The graph below (participant nine) shows this quite markedly. (Only correlations greater than 0.4 or -0.4 are shown).

Positive Correlations   Negative Correlations

sculptor / painting	0.82	designer / computer modelling	0.56	sculptor / self	0.42
woodwork / mountaineer	0.81	designer / digital imaging	0.54	painting / mountaineer	0.41
sculptor / mountaineer	0.74	inventor / self	0.5	sculptor / digital imaging	-0.66
woodwork / self	0.68	practicing artist / mountaineer	0.48	ideal self / washing up	-0.6
designer / practicing artist	0.64	typist / digital imaging	0.47	digital imaging / illustrator	-0.49
illustrator / mountaineer	0.64	mountaineer / self	0.47	mountaineer / digital imaging	-0.47
computer modelling / digital imaging	0.6	practicing artist / sculptor	0.42		

Figure. 2

It is particularly interesting that his participant - and others - showed a curiously paradoxical set of correlations between the element 'practicing designer' and IT. While this element is strongly positively correlated with 'practicing artist' it is also strongly positively correlated with IT. Four of the participants correlated 'a practicing designer' positively with computer modelling and digital imaging, six with digital imaging as well. This is discussed further in relation to results from Question 2 (below).

Certain of the activities represented in the list of elements which have very clear characteristics in the everyday world - typing for instance - correlate with the other elements in ways flesh out the attitude to IT discernible in the study. In the case of this participant, typing, characteristically perhaps a mechanical and emotionally disengaged process correlates with digital imaging. This implies that the participant considered that they share qualities. This attitude to IT is amplified when the negative correlations are considered. Digital imaging correlates negatively with 'sculptor' and 'illustrator', as it does with 'mountaineer'.

The correlations with 'mountaineer' confirm the associations between creative roles and activities and the distinction between these and IT. 'Mountaineer' correlates strongly with the roles 'sculptor' and 'illustrator' and the activity 'painting'. The qualities of 'mountaineer' which are at work in this relationship can only be guessed at in this analysis, though there may be a relationship between the isolation of a mountain environment and the supposed elite individuality of 'creative people' according to the romantic stereotype. This may appear far fetched, but John Carry has identified a deep rooted and long established spatial metaphor for the relationship between avant garde artists and writers and the rest of humanity, which he traces in the writing of Clive Bell and followers of the philosophy of Nietzsche. [xxxiii]

6.2. QUESTION TWO

If all ten grids are considered together, a clear tendency is evident. The following elements showed no correlation with 'self', suggesting that the use of computers is irrelevant to the respondents' self-concept:

| Typing | -0.02 | Digital Imaging | -0.07 |
| Washing Up | -0.23 | Computer Modelling | -0.05 |

However the following elements do show a small but significant correlation with 'self':

| A Sculptor | 0.38 | A Practicing Designer | 0.32 |
| Woodworking | 0.35 | A Practicing Artist | 0.35 |

These results relate to the impression given by the individual grids, although this is not completely straightforward. The four elements in the two groups above tended to correlate with each other, with the one exception already mentioned - that, while the two roles 'practicing artist' and 'practicing designer' are apparently perceived as sharing some qualities, they are distinguished from each other in their relationship to IT. If we suggest that the subjects were making judgements which related to ideas about creativity it might be said that a 'practicing designer' is not generally considered to be creative. On the other hand, if we look at the correlations between the elements and 'self', 'practicing designer' joined the other 'creative elements in being positively correlated with 'self', while the computer based elements joined the clearly non-creative elements such as 'washing up' and 'typing' in having no correlation with 'self'.

The students are therefore demonstrating that, on one level, computer modelling, digital imaging and designing are perceived to be similar sorts of activities, while at another level they are quite happy to think of themselves as designers, but not comfortable with the idea of themselves as computer users. Could it be that designing as an activity is viewed in one way, quite pragmatically, while the idea of oneself as a designer lines up with the romantic view of the artist? This contradiction goes to the heart of our concerns and will be one focus of further investigation.

6.3. QUESTION THREE

To address this question results were interrogated in a way which concentrates on the linguistic information provided by the grids. Each grid includes seven terms provided by the participant which relate to the elements given. While each participant will have their own relationship to the terms they used, taken together, these constructs offer insight into the strong qualities which the group of participants perceive in the elements. Each grid was analysed to discover strong correlations between the constructs elicited and one of the constructs supplied - creativity.

Clear groupings can be found within the constructs which correlated positively with creativity.

One seems to relate creativity to knowledge and wisdom:

| Thought | Intellectual |
| Imaginary | Knowledge |

Another certainly relates it to some of the features of the romantic paradigm for creative individuals and the creative process:

Fluid	Expressive
Free	Nature
Lively	Perceptual
Voluntary	Colourful

Another seems to associate creativity with processes which are mysterious:

Multi dimensional	Intriguing
Complex	

Left over is a selection of constructs which are not immediately categorisable:

Ideological	High tec
Appealing	Level / ease

Apart from the last three, these constructs describe a set of attitudes to creativity which are as one would expect. Whether considered as a process, or an attribute of people, it is clearly understood to have something to do with high level mental processes and expertise. It is also not considered to be immediately explicable or 'knowable'. Perhaps connected to this last, it is characteristically unfettered, 'natural', to do with expressing something.

The following constructs were found to correlate negatively with creativity:

Boring	Functional	Cerebral
Practical	Professional	Intellectual
Pathetic	Combining	Unskilled
Weak	Perfection	Actual

Many of these terms are negative by any measure - boring, pathetic and weak for example. Curiously however the list includes two terms which seem to belong in the 'knowledge and wisdom' category which correlated positively with creativity - 'Intellectual' and 'Cerebral'. 'Intellectual' actually appears in both lists. This may indicate the variation in conceptions of creativity which existed in the group of participants, or perhaps it indicates that these terms have different meanings as they appear in the two lists. With its connotations of dry, disengaged reason, 'Cerebral' puts a negative gloss on 'Intellectual' from that which it gets from its relationship to 'Thought', 'Knowledge' and 'Imaginary' in the other list.

Some of the remaining constructs in this list perhaps fall into another group. 'Practical', 'Functional', 'Professional', and 'Actual' have in common a certain real world pragmatism which is characteristically not individualised - practical and functional solutions generally affect many people and are anonymous. A member of a profession adopts a role vested in them by that profession, not built out of their unique individuality. According to a certain attitude, the 'Actual' facts of the world do not allow for poetics.

The participants were not directed in their interpretation of the term 'creative'. They spontaneously chose to associate it with the qualities above in the ways they did. It is unarguable that some of the constructs which correlated negatively with creativity have the potential to be associated with activities

which are indeed creative in the sense of producing objects or processes or ideas which are new to the world. 'Professional' or 'Functional' are examples of this.

Future plans for study in this area include a factor analysis of our results which we believe will give a numerical value to these results.

7. Conclusion

Our initial supposition, that the problems that many of our best students have with IT may lie in their attitudes towards themselves as creative people and towards computers appears to be vindicated in this study. It would appear that the participants came to their studies with the romantic paradigm for creativity as an important component of their attitudes to both their studies and themselves. At the same time the participants show a distinctly negative attitude towards computer based activities, particularly in relation to their own self-image.

A number of avenues suggest themselves for future work in this area, including a re-designed grid administered to a larger number of people, including some assumed to exemplify the qualities of the nerd. One aim will be to investigate the differences which emerged between the relationship of IT to 'a practising artist' and to 'a practising designer', despite the fact that these two roles related similarly to the students' self-concept. We would also like to explore the notion of a 'computer nerd' as a cultural stereotype which may be damaging the potential of computer use among artists and designers, just as the stereotype of the 'romantic genius' may be damaging in this and other fields.

Even in the results of this initial study there are clearly implications for higher education in art and design in general, as well as the introduction of IT to students at the early stages of their degree. It has been instructive to see how strongly the romantic stereotype of creativity is ingrained in students who in most cases have not come straight off the streets, but from previous art and design courses. It may be that the introduction of computers as a means to produce art and design work should run parallel to an element which purposely attempts to modify the attitudes encountered - most directly perhaps by showing the recent history of the ideas on which the romantic stereotype is based. This may not need to take place within computer classes, but might more productively be attended to in historical and critical studies.

If this teaching takes root, it may be that a greater proportion of students with developed ability in the traditional formal and conceptual areas of art and design work become leaders in the use of IT for purposes which are truly new to the world, truly creative.

[i] Jung, C G (1923) *Psychological Types - or the Psychology of Individuation* London: Routledge and Kegan Paul

[ii] Treffinger, D J (1986) 'Research on Creativity' *Gifted Child Quarterly*, Vol 30 No 1, pp 15 - 19 Cited in Bruce, R (1989) 'Creativity and Instructional Technology: Great Potential Imperfectly Studied' *Contemporary Educational Psychology*, 14, pp 241 - 256

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