

A Cognitive Investigation of a Material led Art process

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Abstract. There is a wealth of research investigating the cognitive engagement of tool users and much debate about whether our cognition can extend to the tool tip or incorporate the tool into our body schema. I contend that an expert materials led artist, can cognitively extend beyond the tool in use to the material that they engage during art making. I interviewed three expert artists, a painter, a potter and a sculptor about their tool use, materiality, environment and expertise. Their insights confirm a tacit knowledge that extends into the materials they engage and informs their actions. The experience of these artists' forming an expertise with their chosen material offers the Enactivist approach insight into a higher-order form of Sense-making, rather than just 'maintaining a meaningful environment'.

Keywords: materiality, art process, Enaction, extended cognition, Sense-making, tool use, and expert artists'

1 Introduction

There is a wealth of research investigating the cognitive processes of tool use but a deficit of enquiry into the cognitive processes of engaging beyond the tool with materials. I contend that an expert artist can cognitively extend or incorporate the material that they engage during art making, creating a loop, which informs the artist's practice and emerging work. To investigate this contention I interviewed three expert artists, who have specialised in working with one material (clay, paint or metal) for a minimum of thirty years. I have followed the active loop of, skilled artist, the tools being used and the materials they are engaging which influences the artists' response. I have considered how the experience of these experts informs the discussion of extended mind theory [1] while incorporating research on tool use and the experience of materiality. I propose this process of actively engaging material offers the Enactivist approach to cognitive science, where an autonomous

system enacts or generates its own cognitive domain [2] an account of higher-level cognition, which has been proposed as lacking by Mc Gann [3].

2 The Art Process

A materials led artist's practice is one of a myriad of other art practices, which may engage a multitude of cognitive processes. I have selected a material led artist's practice as it offers an opportunity to research a direct physical engagement with a tangible material. The level of focused engagement the artist attains with their material varies, depending on the artists' approach to the material and their level of skill and expertise. The three expert artists I have interviewed are: Brian Keogh, a potter who has specialised in working with clay for 37 years, Patrick Graham, a painter who has been painting for c58 years and John Coll, a sculptor who has specialised in metals, mainly steel and bronze through the processes of welding and sculpting clay for bronze casting for 32 years. Each artist's process is unique and each of these experts has a different experience to offer. As Noë [4] eloquently relates, "Art isn't a phenomenon to be explained. It is rather, a mode or activity of trying to explain". The experience of these artists' forming an expertise with their chosen material offers insight into a higher-order form of Sense-making, rather than just 'maintaining a meaningful environment' [5] they have created a specialised studio environment that enables a focused art practice.

2.1 The Art Process Loop

The Art process begins with the artist attempting to get past the brains attempt to 'predict' what it will perceive, suggested by Clark [6] as a method of "neural frugality" of cognitive resources which is efficient in everyday perception. In what Gibson [7] would call an "education of attention" the artist engages in a deeper perception, which of course is also happening haptically. This tactile knowledge is experienced through our highly adapted hands. Prinz [8] illustrates how incredibly receptive our hands are, with 3,000 receptors in each fingertip, proprioceptive feedback about our hands position and

kinesthetic information about the tension in our muscles. Our hands are central to our activities and function so consistently that they become seemingly invisible.

3 Tool use and Extension of Cognition

The next aspect of the art making loop are the tools the artists' use. There has been a wealth of philosophy and experiment to grasp an understanding of how we utilise tools and whether tool use demonstrates an ability to extend our cognitive abilities into the environment. Merleau Ponty [9] examined how we experience tool use using an example of a blind man who can perceive the tip of his cane. Clark and Chalmers [1] propose in their 'Extended Mind' theory, that we can extend our minds into our environment. Experiments on tool use, adds insight to Merleau Ponty and Clarks hypothesis' and formed my interview questions relating to tool use. Patients with brain damage such as visual neglect¹ respond differently to peripersonal space (within arm's reach) and extrapersonal space² [10]. This was further clarified in the literature reviewed, [10,11,12,13,14] which showed that when the tool used was a stick (solid not a laser pointer), "far space became re-mapped as near space".

These experiments with varying tool lengths offer evidence to the extended mind theory but further experiments sought to clarify if subjects were 'extending' their perception through the tool or 'incorporating' the tool into our body schema. Cardinali et al [13] designed experiments to investigate tool-use effects in healthy subjects. They asked subjects to use a 40cm mechanical grabber as a tool to reach for a cube. After tool use the subjects were blindfolded and asked to point at positions on their arm. Subjects touched positions (on their tool using hand) indicating that they perceived their arms as longer. Witt, Proffitt, & Epstein, [15] found that after reaching for an object

¹ Visual neglect; can be caused by lesions on one side of the brain, which can cause the patient not to perceive anything on the opposing side of their body, even though their eyesight is not impaired

² Halligan et al (2003 p126) describes extrapersonal space as, beyond arms reach unless we move or use a tool to access it

beyond arm's reach with a stick, observers estimate its distance to be shorter than they do if they reach for it without the stick. Canzoneri et al [16] congruently found "subjects perceived their forearm narrower and longer compared to before tool-use, a shape more similar to the one of the tool", which indicates a perceived 'incorporation' into the subject's body schema or body-model [17].

Concurrently, De Preester and Tsakiris [17] investigated these divergent proposals; they distinguish tool use as being an extension of body capacities rather than an incorporated aspect of body schema. They discuss results found by Botvinick and Cohen [18] who found subjects incorporated a rubber hand into their body schema although it was not touching their body (it was being stroked at the same time as their actual hidden hand). This caveat brings an exception to the importance of the perceiver actively using a tool or rubber hand to incorporate it as theirs; it suggests belief has a role to play in our sense of embodiment. De Preester and Tsakiris [17] also found that some people adapted better than others to their prosthetic limbs due to how they believed they fit their body. For Thompson and Stapleton [2] transparency of the hand, body and tools, while we are in engagement with our environment distinguishes between resources used "instrumentally and resources that come to constitute the cognitive system over some stretch of time".

Following these findings of belief factoring into our perception of tool use, I asked our three artists if they have a favourite tool and how they respond to using a new tool. All three artists were immediate in their response that they had clear favourites among their many tools. Brian described a bamboo turning tool "that fits in my hand perfectly" [19], which concurs with De Preester and Tsakiris [17] suggestion of the importance of fit. Describing his favourite brush Paddy says,

It is an extension, it really is an extension of myself and it is battered and bruised and it takes on character over the years of struggling to make the mark [20]

John's favourite tools for clay sculpture were two stainless steel tools that are double ended and fit within the parameters of his hand [21]. When I asked John about using his welder he described it as "like an extra finger on my hand" [21]. This may suggest that John perceives his TIG3 welder as "a sixth finger" [30] because of its 'fit' in his hand which fits the incorporation model related by De Preester et al's [26]. John compared his present TIG welder with his previous experience with stick welders (where the rod is c20cm), which he found was "more difficult to control" [21]. Although John listed a multitude of reasons, why the stick welder was more difficult to control, I suggest the distance between hand and weld being created was a contributing factor. I suspect the designers of his present TIG welder created a hand held device in response to this factor. I had also imagined that John's welding mask would be a barrier between him and the puddle of metal weld as it is forming, however John finds it helps him to block out everything else and just focus on the weld.

I asked all three artists' about the extended mind theory and they all discussed 'extending' through their favourite tools, adding the importance of how they afford a lack of interruption. Paddy related adapting to a new brush as, "it's just going to give you this awful kind of ... controlled line... but actually the white [of the new bristles] is a big intrusion" [20]. He described his favourite pencil from a collection of 200-300 pencils, "I just reach for this one all the time. I hate when it gets (gesturing a small pencil)... I hate pairing it" and when it's gone, "I have to go and breed another one" [20]. Brian elaborating on why his bamboo turning tool is his favourite tool he said, "it's something that I work with spontaneously without deliberating and it carries out the task without too much thinking"[19]. This perception of the used tool being invisible illustrates Heidegger's [22] hypothesis of it being "ready to hand" whereas a new brush or pencil becomes "present to hand", intrusive and not invisible.

All three artists had their favourite tools for a long time, Brian had his bamboo tool for c20 years suggesting familiarity over time using these imple-

³ Tunsten Inert gas welder

ments contribute to the tool becoming transparent and non intrusive in the active engagement between artist and material. Paddy described the importance of becoming familiar with a tool as, “it becomes intrusive, you have to get rid of that notion of this thing is between you and this because otherwise you don’t feel the medium” [20]. It is the importance of an artist being able to feel the material or medium that I shall extend to next.

4 Materiality

Materiality is an area of research that I propose has been largely under-researched. Malafouris [23] has also found the research in embodied cognitive science, lacking a “theory of material engagement”, a sentiment echoed by Ingold et al [24, 25] from the field of anthropology. He suggests that because from infancy, we actively build our knowledge of objects and materials through interaction, it becomes a process of “phenomenological osmosis” [26] that is so integrated it becomes unnoticed. The student and the expert alike may begin with ideas of what they wish the material to express but this can change in the process of making. Hayles [27] defines materiality as requiring active, attentive focus on physical properties and yet “materiality is unlike physicality in being an emergent property, it cannot be specified in advance”. It is as Brian describes it a “tacit knowledge” and, “that’s something you can’t teach people” [20], it is understood through experience. I asked the three expert artists about their experience of engagement with the materials they have specialised in and all of them talked about extending into the material. I asked Brian while making pottery, if he found the idea of extending into the material credible and he replied,

You must feel in tune with the...first of all, the tool in your hand, also the machine that you’re working on and the material that you are directing the tool towards. So there has to be a unity of connection between all those things so that makes perfect sense to me... It’s a given. It’s part of that tacit knowledge [19].

John described his responsiveness to the material as he is working as “being open to its limitations and its possibilities” [21]. This remaining ‘open’ maxim

that John mentions, where an artist will 'keep their mind open' to possibilities is congruent with Clark [9] he describes sensing as, "the opening of a channel, with successful whole-system behaviour emerging when activity in this channel is kept within a certain range".

It is perhaps to an artist an obvious question to ask about the importance of understanding their material; it is the aim ultimately, to understand your material or medium so well so that you can get beyond the technical to reach further potentials. Brian described, "Knowledge of material is a fundamental" [19]. Brian described putting the clay through processes that will bring it to the ideal state to create the type of object he wishes to throw on the wheel,

So there's a big amount of preparation of material and there's a lot of forward planning to make sure the material is in the right...state. Well aged, that is clay that has been recycled and slaked down in water and sometimes left over a period of months. To break down and be re constituted with new clay...which produces a well...mixed and plastic body for throwing that won't crack in the making or won't be stressed by the making [19].

Whereas the oil based clay that John sculpts with is formulated so as not to dry out; which affords John the opportunity to work on a portrait head over long periods of time with no drying-out issues. The environment also influences this tacit knowledge of materials and how they are best worked, in the most immediate case the artists' studio.

I asked all three artists' when they approached working directly with materials how they set up their working space. Brian when he was in pottery production set up his studio space, as "it required a degree of order, cleanliness ...so that the flow of production could continue uninterrupted" [19]. Paddy passionately described his process laying all his tools and materials out before painting as, "It's war! Get all your troops ready, this is a[n] ... assault course" [20]. Their studio spaces afford an individualised environment that is created to enable a flow of uninterrupted work.

5 Conclusion

I have investigated a material's led art process as a cognitive process. I propose this investigation offers the Enactivist approach to cognitive science an account of higher-level cognition, informed by the experience of three expert artists. The enactive approach has encompassed a wide range of animal and environment couplings or engagements including examples of single cell autopoiesis, this "bareness of autopoiesis as a norm", concerns Mc Gann [3] who also enlists similar concerns from Di Paolo et al [28].

I have found it surprising that the premise of the Enactive approach, action and agency have been approached so theoretically, (computational modeling, dynamical systems models etc). I am biased by my immersion in the field of art-based practice that is in itself a fundamental research of experience and engagement. Merritt [29] has approached these same criteria through the engagement of dance, which she relates as "kinetic intelligence" which is an interesting comparison to the "tacit knowledge" described by Brian in his interview. For Merritt 'thinking-is-moving"[29], the dancer evolves their movements as they move, which is a different preface than materiality where the cognitive extension into the material offers this 'thinking' or informing. Merritt does discuss the interaction among interpretive dancers responding to each other offering a valuable insight into this form of artistic cognition. From a comparison of just two fields of expertise (art and dance) a wide range of cognitive engagement is revealed. There is still much to learn from expert specialists in their individual practices of engagement.

I have examined the art engagement loop from the embodied artist, tool use and materiality by engaging the experience of experts in a variety of media. Interviewing three expert artists' about their subjective experience, of their art practice may be questioned by some as not very scientific. I disagree, and I am not alone, Csikszentmihalyi [30] advocated that we have learned much from brain damaged patients and comparisons with healthy functioning subjects but we have underutilized researching exceptional people. As phenomenological and Enactivist concerns overlap and their researchers align I imagine their research methods will also be shared. Creswell [31] proposes interviews as phenomenological research method.

There have been valuable insights into visual perception through new fields of study such as Neuroaesthetics that tends to rely heavily on fMRI data, which to my perception, as the technology stands at present, offers a blurry

picture particularly when investigating the wider activity of human engagement. However I suggest that a matrix of all of these research formats neuroscience, case studies of brain injuries, experiments incorporating healthy subjects and interviews and research with expert practitioners as I have used in this paper do prove a valuable resource to the overall field of study.

I have considered Clark's theory of 'extended mind' [1] through the experience of three expert artists' and a wealth of research encompassing, case studies, practical lab experiments and fMRI experiments offering a wide set of approaches that offer strong evidence that a sense of 'extension' and 'incorporation' is experienced by tool users. I am reticent to adopt the concept of extension of a 'mind' however as it brings to bear a plethora of ambiguous meanings and definitions. I prefer to integrate the term, extended cognition as defined by Chemero [32] to define the actively engaged artist who is closely coordinating perception and action. De Preester and Tsakiris [17] sought to clarify a distinction between 'incorporation' into a body model versus 'extension' of the body model during tool use and propose that prosthetic limbs can be incorporated into a body model but tools do not change our body model and are thus an example of extension. I suggest that the 'body model' schema rings too close a tune to an internal and external notion of cognition that I have found no grounds for while investigating an artist engaging material. John's perception of his welder being like a "sixth finger" combined with all three artists unanimously concurring that extension into the material not just the tool is a vital part of their practice suggests that the extension versus incorporation debate may not be as clear cut or perhaps relevant as proposed by De Preester and Tsakiris [17].

Thompson and Stapleton [2] reflecting on the differences between the extended mind theory and the Enactive theory of Sense-making, postulate that the tools and materials of the artists' should be considered part of the cognition system if they function transparently. The transparency of these artists' tools offers an uninterrupted attentive engagement which may be referred to as 'flow', a state when the artist, tool and material become a looping cognitive system. However the engaged art material doesn't become transparent it becomes the ultimate locus of the extended cognition. This raises an interesting caveat to Thompson and Stapleton [2] who ascertained that transparency signifies inclusion in a cognitive system. These artists' are extending their perceptive focus to the crucial active materiality of engagement, coupling with the material. This engagement combines a multitude of facets including tacit knowledge and meaning making which is attributed to by emotion and belief.

The artists' emotion is suggested by Thompson and Stapleton [2] to attribute "salience and value for the system", which contribute to autonomy, an essential factor in an Enactive system. I asked each artist, why they continue to engage their specialist material, John about Bronze said, "I think it's to do with an inherent luminosity in Bronze that comes through... It makes clay look...it brings clay alive" [21]. Paddy said, "the ecstasy of being lost in a creative nothingness and having to stagger your way out of it, that's the journey" [20]. Brian about clay said, "it will also give back responses that sometimes are unpredictable, surprising, sometimes disappointing but sometimes exhilarating" [19]. I conclude that there is no shortage of emotion and value for these artists in their chosen engagement. Thompson and Stapleton [2] cite Clark's "information-processing models as limited", as they fail to explain autonomy and therefore cognition, there is no such limitation in the engagement of an expert individual.

The artist picks out which aspects of the world he or she "structurally couples with" [33] which, is an Enactive "co-emergence of self and world 'sense-making'", a utilization of affordances to meet their needs. Cognition is relational, it is an active state not bound to a cluster of neurons, muscles, or the like but active engagement. These expert artists' assert that knowing your material is "essential", "fundamental", and coupling or looping with this material at a new level every time is their research, their Sense-making, and this research continues to challenge them and inform us all.

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