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Turning thinking on its head: How bodies make up their minds

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ABSTRACT

The assumption that bodies have little to do with thinking – other than to be the vehicle that gets a mind to a classroom – deeply underpins the traditional model of schooling. Lessons and seminars are designed on the premise that thinking happens best when people are pretty still, their bodies are quiet and undemanding of attention, and they are writing or talking. Unless it is interfering, the physical body has little to do with cognition. This paper offers an overview of the emerging field of 'embodied cognition' that profoundly challenges this model of the mind, and therefore undermines many of the assumptions that underlie the dominant sedentary and disembodied approach to the high-status bits of education.

Robinson (2006) joked in his much-watched TED lecture ('Do schools kill creativity?') that intellectuals tend to see their bodies merely as a way of getting their minds to a meeting. An exaggeration, to be sure, but pointing to a deep-seated assumption in Western culture about the relationship between the physical matter of which we are composed, and conscious mental activities that seem to be of a different order, hovering over the physical body like a 'Thinks' bubble in a cartoon. The assumption that bodies have little to do with thinking – other than to be the vehicle that gets a mind to a classroom – deeply underpins the traditional model of schooling. Lessons and seminars are designed on the premise that thinking happens best when people are pretty still, their bodies are quiet and undemanding of attention, and they are writing or talking. Unless it is interfering, the physical body has little to do with cognition. What happens in the playground or on the sports field involves lesser kinds of thinking, or none at all. In this paper I want to offer an overview of the emerging field of 'embodied cognition' that profoundly challenges this model of the mind, and therefore undermines many of the assumptions that underlie the dominant sedentary and disembodied approach to the high-status bits of education.

1. The 'official doctrine'

Let me begin by outlining in a little more detail the dominant model of mind, brain, body and self that Ryle (1949) dubbed the official doctrine (TOD). Despite being rarely stated so explicitly, cognitive anthropologists (e.g. D'Andrade, 1995) have been able to unearth the assumptions behind conventional discourse about thinking and the mind, and largely confirm TOD. TOD assumes a close relationship between intelligence, conscious thought and human identity. Thought, roughly, is the voice of a ghostly Mini-Me that sits in the brightly lit front-office of the conscious mind, interpreting information that arrives via the sensory channels, adding knowledge from memory, working these sources of knowledge and information together through the process of thinking – the more logical, explicit and clear-cut the better – coming to decisions and issuing orders to the menial neuromuscular systems of the mouth, fingers, legs and so on. Information arrives via the body, through the senses, and leaves via the body, through physical movements, but in between a more ethereal kind of intelligence, ungrounded in the body, takes over. Perception and action are therefore seen as less 'intelligent' than Thinking, and are placed at opposite

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ends of the processing chain, acting as the separate bodily portals through which Inputs arrive and Outputs depart to engage with the External World. When the body does impact on thinking, through physical needs and emotions, for example, its influence is often seen as distracting, disruptive or unreliable. In the mental models of Freud, Plato, and many thinkers in between, the job of the mind is to stay quietly reasonable in the face of libidinous or selfish forces emerging from the body that continually threaten to undermine 'intelligence proper' (see Claxton, 2005a, 2005b).

Much of the recent work in education on 'thinking skills' and 'emotional literacy' accepts and reinforces TOD. Thinking skills are overwhelmingly seen as conscious, deliberate and rational. The teaching of thinking skills is heavily weighted towards intellectual processes such as the critical analysis of logical argument, the conscious consideration of different sides of an argument, and so on. The medium is language, or the lawful manipulation of mathematical or scientific symbols, and the processes of the body are rarely mentioned. Concerns with 'emotional literacy' often focus on the development of strategies for the 'self-regulation' of emotions, in order to prevent them from interfering in the cooler workings of reason. Studies of 'emotional intelligence' tend to focus on being intelligent *about* emotion, rather than on the inherent intelligence *of* emotion (Claxton, 2005a, 2005b).

In summary, there emerges from TOD a view of intelligence which marks quite lot of human experience as inherently less or un-intelligent. The word 'intelligence' should be reserved for cognitive processes that are

Clear-cut – and therefore not vague or ill-defined.
Logical and dispassionate – and therefore not emotional or heart-felt.
Explicit and well-justified – and therefore not intuitive or a 'feeling'.
Verbal/propositional – and therefore not manifest in other forms of experience such as physical gestures or promptings.
Explanatory and symbolic – and therefore not to be found directly in perception and action.
Rapid and on-demand – and therefore not requiring patience or contemplation.

These characteristics give the acronym CLEVER, so we might say that TOD sees intelligence as CLEVERness, in the above sense. Conventional measures of intelligence such as IQ tests pose logical problems that appear 'out of the blue', as it were, not emerging from a complex personal 'theatre of action and concern', that require clear and rapid thinking under pressure to arrive at a 'right answer'.

2. An alternative view of intelligence

> It is a profoundly erroneous truism, repeated by all copy-books and by eminent people when they are making speeches, that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilisation advances by extending the number of important [i.e. intelligent] operations which we can perform *without* thinking about them. Operations of thought are like cavalry charges in battle – they are strictly limited in number, they require fresh horses, and they must only be made art decisive moments.
> A.N. Whitehead

Many psychologists of education such as Gardner (1999), Resnick (1999) and Sternberg (2000) have questioned this abstract, intellectually focused view of intelligence, not so much on the grounds that it is wrong as that it is radically incomplete. A single, quite specific, form of intelligence has come to usurp the whole field of what may legitimately be considered intelligent human action. In experimental psychology, too, there is a growing recognition that an intellectualised view of the mind may have put the cart before the horse, as it were. In a recent review article on 'embodied language', for example, Fischer and Zwaan (2008), conclude that: 'For much of the time spent studying human cognition, actions have been seen as trivial appendages to the seemingly more sophisticated mental operations subserving "higher level" cognition such as object identification, language comprehension or decision making' (p. 825).

Real-world intelligence (Lucas & Claxton, 2010) emerges when embodied beings with feelings and concerns find themselves in complicated situations in which it is not immediately obvious how to proceed. At any instant, people possess a range of active (though not necessarily conscious) *concerns*: to get the assignment finished; to check emails; to make a cup of tea; to remember to make a doctor's appointment; to take some exercise; to go to the toilet; to decide what to have for dinner; and so on and so on. They also possess a wide range of skills and *capacities* that might be useful in pursuing those concerns: knowing how to get to the toilet; checking recipes to see if all the ingredients of a dish are to hand; and so on. And they find themselves in a multi-faceted situation that contains many *opportunities* and hindrances that relate in complex ways to the existing portfolio of interests, anxieties and concerns: a watch enables me to check if there is time to get to the shops; the phone is missing from its cradle, making the call to the surgery more problematic; and so on. Real-world intelligence, we might say, involves taking these three arrays or 'fans' of options – the concerns, the capabilities and the current opportunities – and resolving them, in real time, into an optimum answer to the question: 'What do I do next?' That's what brains–and the human brain *par excellence* – have been designed by evolution to do. And the more multiple the arrays of concerns, capabilities and opportunities are, and the more complicated or less routine the process of resolving them into a course of action is, the more 'intelligent' we think that process to be (Damasio, 2009).

From the embodied cognition perspective, then, 'doing' and 'wanting' are more important and more fundamental than thinking. The basic purpose of intelligence is to get things done that matter. Theorising, articulating, interpreting and

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understanding the world are not the bottom line of intelligence; they are tools that may support the construction of intelligent actions and responses. Conscious, deliberate 'thinking' may play a crucial role in such intelligent problem-solving; or it may be completely absent; or it may itself constitute a hindrance or a source of paralysis. The scientist writing a grant proposal probably spends a lot of time consciously considering possibilities. A footballer receiving a floated pass and 'deciding' whether to make a run down the wing or to pick out a team-mate who is sprinting into the box is probably 'thinking' very little. A self-conscious young man suddenly confronted with 'the partner of his dreams' may get caught in a bout of analytical thinking, exploring the consequences of different 'moves' like a chess player – and completely miss the moment (and the point). Deliberate thinking is not intelligent per se; it is, as Whitehead observes, the way it is used and deployed that may be highly intelligent and appropriate, or may not. Indeed, we might define real-world intelligence as *the optimal deployment of one's resources, in the service of one's values and concerns, given the exigencies, opportunities and constraints of the current situation*. One of those resources is conscious thinking; but it is only one.

The creation of purposeful and appropriate behaviour is therefore at the core of human (and animal) intelligence. And if we look in the brain, we see that the motor system, far from coming at the end of a long chain of cognitive processes, is at the heart of the action. What we *want* to do, and what we (believe we) *can* do, are dissolved in what we see, and the way we think, right from the word go. One of the pioneers of embodied and embedded cognition, Clark (1998) summarises a weight of recent research like this:

> Perception is not a passive phenomenon in which motor activity is initiated at the endpoint of a complex process in which [we first] create a detailed representation of the perceived scene. Instead, perception and action engage in a kind of incremental game of tag in which motor assembly begins long before sensory signals reach the top level.

Within a few hundredths of a second, the brain blends sights and sounds, hopes and expectations, eye positions and hormone secretions, into the beginnings of a coherent pattern of neural activity that will culminate in the production of a best-fit response (Chemero, 2009). And it often does this without any supervision, or even accompaniment, by conscious thought. The brain is designed to hook up perception with motivation, action with imagination and memory, and emotion with reason. Coins really look bigger to hungry children – perception itself is imbued with motivation (Bruner & Goodman, 1947). Our brains automatically ready themselves to copy the behaviour of others – sensory systems link instantaneously with motor systems in the brain. Imagining an action recruits almost as much activity, in the same areas of the brain, as actually doing it (Decety & Grezes, 1999).

It is a historically recent trick, accomplished only by hard work at some cognitive expense, and of specialised utility, to pull these three facets of cognition apart, as we do when thinking 'off-line'. Abstract, disembedded thinking is in a deep biological sense unnatural (which of course is not to say un-useful: far from it). And when our faculties do become decoupled, as Damasio and his colleagues have repeatedly shown, there are substantial risks and costs, as well as potential benefits. Neurological patients with a certain kind of frontal lobe damage, who can no longer integrate their bodily feelings with their conscious thoughts, continue to score well on IQ tests, but make a mess of their lives. They know the best thing to do, but repeatedly fail to actually do it (Damasio, 1999). In the senses defined above, they are clever, but not intelligent.

3. The embodiment of thinking

Though some people include visual imagery within their concept of 'thinking', for the majority, thinking in predominantly associated with language. Thought is 'inner speech'. So the question arises of what exactly happens in our brains when we are understanding or producing language – either silently to ourselves, or publicly, over the airwaves. When understanding concrete sentences such 'Bill caught the cricket ball', it is hardly surprising that the relevant sensorimotor areas of the brain become active. The specific areas of premotor cortex that control hand movements, and areas of visual cortex that subserve perception of round objects, automatically light up. Comprehension of the sentence, in other words, is performed by translating the words back into their non-verbal referents and connotations. Slightly less unsurprising, the same process of sensorimotor activation happens when the sentence does not convey any explicit motion. When you hear that 'Anna had forgotten her BlackBerry', your brain automatically primes your motor cortex to make small pressing movements with your thumbs; while if you read that 'Mark had lied about the stapler', you have readied yourself, without knowing it, to make a sharp downwards thrust with the palm of your hand (Masson, Bub, & Newton-Taylor, 2008). The brain's default response is to get you set to *do* something.

Really interesting though, is the fact that the brain continues to do this while it is processing what looks like quite abstract language. For example, 'Judith delegated the responsibility to Sheena' automatically primes the motor cortex to move your hands outwards from your body in a gesture of 'giving' something to someone (Glenberg et al., 2008). The specific nature of the brain activation is almost exactly the same as if you had been told that 'Judith gave the pizza to Sheena'. 'Mitt is running for President' primes activity in the legs. 'Guy fought off the cold' literally but subliminally sets the brain to harden the musculature of the face and energise arm and shoulder muscles. In other words, abstract usages never forget their visceral origins.

These metaphorical roots may be distant and remote, but they remain actively connected to the abstract fruits and branches to which they give rise. We may have forgotten that 'kicking a habit' is a metaphor – but our brains have not. Brains connect bodies to thoughts – even those that are intellectual or conceptual – all the time, sometimes with quite practical effects. In the Glenberg studies, the direction of movement implied in 'Judith gave the responsibility to Sheena' interacts

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with the physical direction in which your hands have to move to make a response. If you have to move your hands towards you to signal your understanding – i.e. in the opposite direction to the one implied in the sentence – you are slower to do so than if the directions match.

Thus the idea popularly attributed to Jean Piaget, and widely believed in education, that we 'grow out of' our reliance on the concrete and the sensorimotor, and that once we achieve 'formal operations' we can happily kick away the ladder of physical experience that helped us get there, turns out to be highly questionable. Bodies are a whole lot more than vehicles for getting minds into classrooms, and they may deserve a greater and more sophisticated role in education than merely 'letting off steam' in the playground or on the sports field.

4. Gestural intelligence

In the previous section we looked briefly at evidence for the role of body in mental activity as we process and understand language. But what about the way we produce language? Where do our thoughts and utterances come from? As we talk and think, does the rest of the body merely have a role in articulating and expressing what comes to mind, or is actually implicated in the process of thinking itself?

The world over, people accompany talking with gesturing – even when they are talking on their mobile phones, and the person they are talking to obviously cannot see the gestures they are making. And we gesture more when we are actively thinking, reasoning and arguing than when we are merely describing something we know well (Clark, 2008). Research by Goldin-Meadow and Wagner (2005) has shown that these gestures are no mere ornaments to the process of thinking and communicating, but are of the essence. The way children gesture while they are trying to explain their understanding – of a mathematical operation, for example – often conveys a deeper level of understanding than their words do. If children are made to sit on their hands, their apparent level of cognitive development and conceptual comprehension are reduced. And if you analyse children's gestures carefully, they often reveal greater richness of understanding than their words do. Goldin-Meadow argues that gesture 'expands the set of representational tools' that are available to us to express and develop our thinking, and that these other channels are able to add subtlety and creativity to our own cognitive processes. Gestures can draw on visual and spatial imagery, and capture holistic aspects of a situation, for example, where speech may have to be more linear and segmented. It is also possible, Goldin-Meadow has found, for the language of gesture (and other paralinguistic features such as voice quality, posture and eye movements) to be more daring or creative in the meanings they express than our tongues or pens are yet willing or able to be. Teachers who are more sensitive to the meanings inherent in children's gestures are more likely to sense when a student is on the cusp of learning something new, and to intervene productively.

The idea that gestures carry meaning that is substantive rather than ornamental – intelligently complementary to verbal or symbolic thought – has led McNeill (1992) to a radical view of the origins of conscious thought itself. Careful analysis of the way speech and gesture twine together, in the telling of a story, for example, has led him to propose that thought and gesture 'well up' together from a common impulse that begins at the unconscious, neural level. What we want to communicate starts life, we might say, deep in the dark depths of the brain stem as a neural pattern linked closely to our current concerns and motivations. In our mind's eye we might imagine this neural stirring beginning to bubble up through the various levels of the brain, taking shape and starting to grow into more precise specifications of speech and action. At some point in this evolutionary unfolding, one branch strikes out in the direction of the articulatory muscles of the tongue and throat, while another branches out towards the bits of the motor cortex that controls the hands and arms. All being well, these two branches of activity culminate, at about the same time, one in a string of words and the other in a series of gestures, each carrying something essential of the original seed or impulse, but conveying an aspect of that impulse that its particular representational system allows.

5. The appearance of consciousness

Both of these branches may flower without much in the way of consciousness. Often we are unconscious of our gesturing (and may be quite disconcerted when someone calls our attention to it). Equally, we often speak without either pausing to monitor or correct the impending utterance. E.M. Forster famously asked, 'How can I know what I think till I see what I say?' We may even not be (very) aware of what it is we are saying as we are saying it. Someone else can play back to us something we said, and we respond, 'My goodness; did I really say that?' But sometimes we *are* conscious of what we are saying, or about to say, and if we find ourselves rehearsing with awareness something which we might possibly say, we call that 'conscious thinking'. (This often happens, bidden or unbidden, as we replay, edit and improve the conversations of the day, in bed that night.)

But what makes one unfolding neural process turn into a conscious train of thought, and another result in an (equally intelligent, or unintelligent) action or utterance that is unaccompanied by any conscious recognition? For the disciplines of embodied cognition and consciousness studies, this is the $64,000 question. Their aim is to understand how and why bodies create the experience of conscious thinking. Instead of seeing 'thinking' as something that floats in a rather ambiguous bubble, somewhere above the human body, they try to see consciousness as a concomitant of certain states and activities of the body, as it engages with the shifting array of opportunities, threats and resources that constitute its world. The new science aims to do away with the mysterious, dualistic Mini-Me, talking out loud in the hall of consciousness (and presumably

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being listened to by another Mini-Me), and instead tries to figure out what is special about the minority of bodily states that generate accompanying consciousness.

We are a long way from knowing in any detail what the neural correlates of any specific state of consciousness are, but authors such as Damasio (2009), Edelman and Tononi (2000), Llinas (2002) and Velmans (2009) have made some similar suggestions at a more general level. Conscious awareness seems to be associated with patterns of neural activity, albeit temporary, that achieve a degree of *intensity* and *stability*. Thus consciousness is often associated with focused attention. This seems to be potentiated by activity in the frontal lobes which create high levels of inhibitory 'corralling' around other centres of activity, thus sharpening and strengthening them, relative to the general and continual buzz of background activity in the brain (Lustig, Hasher, & Zacks, 2007).

This in turn seems to be associated with three general kinds of processing in the brain. The first is linguistic or symbolic. By their very nature, words tend to be more clear-cut and sharply delineated than the non-verbal experience out of which they are carved. And thinking in words, which need to be strung out into more-or-less grammatical sentences, tends to be slower than the fleeting images of direct experience. Second, conscious awareness tends to accompany processing that is related to one's core sense of self. Edelman and Tononi, for example, think that, at any moment, there is in the brain a kind of master pattern of activity, which they call the 'dynamic core', which binds together all the activity that relates to one's most important current concerns. By definition, this shifting core has a degree of stability, and other patterns that get bound in to the dynamic core appear in consciousness while others, which may be equally active but which do not achieve this temporary status, carry on their activity without any accompanying awareness. And third, consciousness tends to appear when we are faced with situations that are unclear, ambiguous or problematic, where we need to slow down, pay more careful attention and 'check our assumptions'. *Why* these kinds of complex, semi-stable, concentrated patterns of activity in the brain (and the body) should be accompanied by consciousness remains – and probably always will remain – a mystery.

However preliminary these ideas are, they do suggest that consciousness is not a 'place' in the mind, or a mental search-light, that mental 'contents' can be 'in' or not. These are familiar metaphors, well used by psychologists from Freud to the present day, but they may not be either accurate or helpful. The mind is not like a library with a whole array of dark book-shelves surrounding a bright-lit worktable, and an earnest scholar scurrying to collect 'memories' from the dark and examine them, and write new instructions, in the light. Rather the whole activity of the embodied mind is intelligent and dynamic, and just a small and rather specialised fraction of that activity, as it continually wells up, somehow acquires the fleeting aura we experience as consciousness.

6. Rebalancing the mind: some illustrations

Research in embodied cognition thus leads us to a wider view of intelligence, one that is distributed across the whole field of our embedded, embodied activity, and not just associated with the most conscious, rational, verbal and explicit corner of that activity. Intelligence is not in opposition to 'emotion', 'intuition' and bodily 'feelings', but is a broader concept that includes them all – as well as deliberation and analysis. The brain automatically blends perception, action and motivation into a swirl of affordances, opportunities and intentions that need resolving, moment by moment, into an orderly sequence of responses to the world as we find it. In the light of this embodied view, it is not so strange that children's gestures turn out to be part and parcel of their intelligent thinking, nor, when I enquire whether you have 'grasped the argument', that your brain has subliminally readied you to clench your fist.

Conscious, rational thinking is now seen not as the epitome of intelligence, but as one sophisticated tool in the tool-kit of intelligence which has its place, but which can be misapplied. These limitations have been explored in a variety of recent experiments. For example:

- When trying to remember an array of faces, it is not a good idea to try to describe them to yourself. Faces you have turned into words are less well recognised subsequently than those which you have merely gazed at thoughtlessly (Schooler & Engstler-Schooler, 1990). What we can say about a face is a paltry fraction of the information it contains, so trying to focus merely on those features that are relatively easily rendered into language means neglecting much of the perceptual information on which subsequent recognition would be based.
- When deciding which of a number of houses to make an offer on, collect all the data, and then spend time deliberately *not* thinking about it. People who have a period of 'incubation', during which they are actively prevented from thinking about the issues, make better decisions than people who have spent the same length of time consciously weighing up the pros and cons (Dijksterhuis, 2004).
- When trying to solve complicated problems where part of the difficulty is that you have made some unhelpful or unnecessary unconscious assumptions, it is good to allow your mind to go blank sometimes (Schooler, Ohlsson, & Brooks, 1993). Allowing your brain to dwell in periods of not-knowing can, like a dammed stream, give the stuck pattern of activity time to back up and find new avenues to explore. The 'Ah ha!' moment is often preceded by a period of uncomfortable but useful impasse - which keeping your mind busy thinking can impede.
- The kind of complex personal problem-solving that happens in counselling and psychotherapy works best when people know how to attend slowly to the welling up of feelings and images in their bodies as they explore the problematic issue

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(Gendlin, 1969). People who rattle off articulate descriptions and explanations have a poorer prognosis than those who take the time to 'um and er'.

- Experienced golfers putt better when they are put under a degree of time pressure, so they do not have the chance to think. If you tell them to take their time they do worse. Beginners are the reverse: if you deprive them of thinking time, their performance declines (Beilock & Gonso, 2008). There are many examples from all areas of physical expertise – sports, musicianship, physical theatre – which show how thinking gets in the way of elegant and intelligent expression.

7. Implications for education

Seen from the perspective of contemporary cognitive science, and the discipline of embodied cognition in particular, much of education now looks partial, dysfunctional and anachronistic, predicated on a model of the mind that is well past its sell-by date. Education is, at root, a preparation for life. Its aim is to help young people develop the mental, physical, emotional and social resources they will need to flourish at a complicated, exciting, stressful time in human history (Claxton, 2008). This involves much more than obsessing about examination grades, canonical bodies of knowledge and access to further study. Not all young people can go to university and not all want to. Many want to make a living by doing useful and sophisticated things with their hands and feet rather than their pens and keyboards: school has to have meaning and value for the budding plumbers, guitarists, footballers and hairdressers too. And the narrow, disembodied view of intelligence makes that parity of esteem hard to achieve.

And it has to show the more naturally studious that the craft of scholarship has an honourable but not a universal value for society. Intelligence is a bigger concept than can be assessed by GCSE grades or a first class degree, and there is more to intelligent living than being knowledgeable and rational. Other non-scholarly virtues such as imagination, empathy, determination and the ability to manage attention in a distracting world, are at least as valuable. (In many traditional societies, kindness was seen as an essential ingredient of intelligence, and with good reason.) These concerns with human flourishing and practical fulfilment, as well as social cohesion and social justice are now being echoed by the new, expanded conceptions of intelligence emerging from scientific laboratories.

Yet schools still sanction and perpetuate the narrow image of intelligence. The high-status subjects are those that rely most on abstract reasoning and verbal fluency. Subjects that require more than rational skills such as 'marshalling evidence' and 'critiquing reasoning' find themselves further down the pecking order. Even the laudable attempts to focus more on the cultivation of 'thinking skills' or 'cognitive capacity building' often privilege those that are conscious and deliberate over the intuitive, the emotional, the practical and the imaginative. If education is the deliberate attempt to help all children enter adult life equipped with the broadest possible range of intelligence-enhancing dispositions, we need to take the lessons of embodied cognition more seriously to heart.

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