CHAPTER

Is vocational education for the less able?

Guy Claxton and Bill Lucas

Given the intrinsic richness of manual work – cognitively, socially, and in its broader psychic appeal – the question becomes why it has suffered such a devaluation as a component of education . . . Paradoxically, educators who would steer students toward cognitively rich work might do this best by rehabilitating the manual trades, based on a firmer grasp of what such work is really like.

Matthew Crawford, *The Case of Working with Your Hands*, pp. 27, 32

When, a few years ago, it was reported that a bright young woman had turned down the offer of a place at Oxford in order to take up an apprenticeship in hairdressing, there was outrage in the press. The general opinion was that she must be mad, perverse or subject to extremely bad advice or influence. Why would someone with the world at their feet throw away their lives, people asked in despair. It is true that this decision will, statistically, have a significant impact on her life choices and her income (though there are, of course, hair stylists who are wealthy, highly articulate and well-respected). But behind the outpourings of opinion one could hear the rumblings of a very deeply entrenched set of social attitudes about the relative merits of the academic and the vocational. These have profoundly influenced educational discourse, and the lives of millions of young people, in the UK for the last 100 years. In this chapter we want to unearth this collection of attitudes and assumptions, and submit them to the scrutiny of contemporary science.

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Before we embark, a word about terminology. We are concerned about the status of, and practical arrangements for, learning that aims primarily at the development of physical skill and sensibility. Though we will focus on what goes on in schools, we are, as our opening paragraph suggests, also concerned about the way education both reflects and reinforces a wider set of social attitudes. This kind of learning has gone by a number of names: practical, physical, manual, technical, vocational and so on. In the USA this educational stream used to be called 'shop class', while in the UK it is now often associated with the subject of 'design technology' (DT). Vocational education has been traditionally associated with the crafts and trades – with a preparation for largely manual occupations such as carpentry, cookery, plumbing, caring, horticulture, mechanics – and 'hair and beauty'. Where academic students study 'subjects' and passed written 'examinations', vocational students followed 'apprenticeships' and gained 'diplomas' and 'qualifications'. In this chapter we most often use the terms 'vocational' or 'practical' to refer to the kinds of learning and accomplishment that have a lot of 'body' in them: skilled occupations that involve manual dexterity (and sometimes physical strength), practical 'gumption' (rather than abstract reasoning and erudition) and sensory acuity.[1]

The status of vocational learning

Walk into any school and it will be immediately obvious that practical accomplishment and physical learning are valued less than study that is more intellectual and scholarly. High-status subjects stay compulsory for longer, have more time on the curriculum allocated to them, and result (all being well) in examination grades that are valued more highly. On these three criteria, English, mathematics and science emerge as the highest status. These subjects centre most relentlessly on the disciplined use of symbols and arguments, and the expression of comprehension through explicit reasoning and written argumentation and computation. As high-stakes examinations get nearer, so even the non-cerebral aspects of these subjects get lost: English becomes more analytical and less imaginative, while science loses it technical and experiential aspect and becomes more frequently a kind of applied mathematics.

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Below these three in the hierarchy come the classic subjects of history, geography and modern languages. Then may come more 'modern' subjects such as psychology, sociology, media studies or business studies. And finally come those that you cannot do just sitting at a desk, staring at a screen, or writing on a piece of paper: art, music and drama; sport and physical education; and DT. To mitigate the general neglect of art, craft and sport, schools typically make a fuss about some specific kinds of achievement in these areas – the unbeaten first XI, the school play well reviewed in the local paper, the success in a national 'art for schools' project. But in educational terms, there is little doubt where the centre of gravity of a school's concerns lie, and it is not in the craft workshops or the gym.

In England we are currently witnessing an intensification of this hierarchy of esteem.[2] A few years ago, schools were judged on the percentage of students who got good grades in five GCSE subjects, and these could include commensurate vocational qualifications such as GNVQs, or more recently BTECs. Then the metric by which schools were judged was narrowed to include only those students whose five good passes included English and mathematics. Now, the vocational equivalents are being excluded from this key performance indicator, so only the traditional academic subjects will 'count'. The three 'championship' subjects of history, geography and languages are about to be promoted to the 'premiership', and reinstated as compulsory subjects up to age 16.

Seven myths arising from bad science

The lowly status of vocational, practical and physical education rests on a number of beliefs. We will just describe these briefly, and then examine them in more detail in the light of contemporary research, especially cognitive and social neuroscience.

Practical activities are cognitively less demanding than intellectual ones

The chief executive officer (CEO) of a major UK learning and development company recently described trades such as plumbing and

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hairdressing as 'menial', implying that they do not require much in the way of intelligence. Such attitudes are very common. The application of these skills in the service of unblocking toilets or layering hair is assumed to be routine and rather mindless. Intellectual activities, on the other hand, such as writing précisé or analysing arguments, are presumed to demand higher levels of cognition and more sophisticated intelligence.

Practical learning is cognitively less demanding than intellectual learning

Not only are practical trades easier and less demanding to carry out; they are seen as simpler to learn. There may be skills and techniques to be mastered, but any kind of learning that is of a more reflective or articulate nature is presumed to be largely unnecessary. Manual skills are thought to be learned largely through observation, imitation and practice, and these learning methods are presumed to be less cognitively sophisticated or demanding than those that underpin more intellectual kinds of performance.

Educational progress involves growing away from practical and embodied activities and towards those that involve reasoning, disembodied knowledge and symbol manipulation

This belief has scientific roots. The massively influential work of Jean Piaget has left a strong presumption in education that 'cognitive development' necessarily involves leaving behind concrete and 'sensori-motor' ways of learning, and progressing to modes of thinking that are 'post-formal', requiring logical reasoning about hypothetical situations that may have few personal, historical or motivational referents. From this, it has come to be seen as the educators' role to help young people make this progression as rapidly and easily as possible. By the end of primary school, for example, physical and imaginative 'play' – the very word is often contrasted with the *serious* business of 'learning' – has largely disappeared to be replaced by the more 'grown-up' activities of reading, writing and calculating. Dressing up and performing are still valued – but increasingly as light relief from the high-stakes business of 'literacy'

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and 'numeracy'. (Even the Latinate abstract nouns seem to add gravitas to the disembodied.)

Academic learning is a better preparation for life than practical learning

Learning to be abstractly rational, analytical and argumentative is assumed to be a better preparation for life than learning to solve practical problems in immediate, concrete situations. The ability to argue, analyse and discuss – to be explicit and discursive – in the absence of urgent need or practical context is seen as being of greater benefit to young people, as they get ready for life in the twenty-first century, than, say, the ability to observe a complex situation with patience and perspicacity. It is assumed that studying abstract, impersonal or historically remote subject matter leads to a better cultivation of these dispassionate, intellectual qualities than does engagement with the messy realities of everyday life. Latin and mathematics are often thought to provide the best 'training of the mind' – specifically, the most useful preparation for adulthood in the twenty-first century – that education can offer, precisely because they are remote from these messy contemporary uncertainties and predicaments.

Those young people who do not follow a traditional academic pathway are generally 'less able' than those that do

They are assumed to lack the 'mental capacity' that is required to study these harder, more abstract subjects, and their education therefore has to centre increasingly on activities that they do seem 'able' to engage with – by default, the lower-status subjects with their lower-value qualifications. If there is evidence that particular under-achieving students are *not* lacking in the requisite 'brain power' (they are not 'less able' but they are not 'fulfilling their potential') then ancillary explanations for their lack of success in the scholarly domains must be sought: poor home background or emotional issues, having 'got in with a bad crowd' or being 'disaffected', or having a clinical condition such as 'attention deficit disorder' or 'dyslexia'. Whatever the specific diagnosis, the physical and practical areas of the curriculum become indelibly associated with those

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who are deficient in some way – intellectually, motivationally, or in their social and cultural milieu.

The only way the esteem of lower-status practical subjects can be (somewhat) repaired is by making them more academic

Given the previous 'myths', it can look as if the only way the esteem of lower-status practical subjects can be (somewhat) repaired is by making them more academic. If theoretical thinking and understanding is 'truly intelligent', and physical ingenuity and dexterity is not, then the only way to raise the status of the vocational subjects and qualifications is to add academic components to them, whether they genuinely contribute to the development of vocational expertise or not. So diplomas and apprenticeships have frequently been bulked up with watered-down theory, to make them look 'weightier' (just as supermarket chickens get injected with water to make them heavier, and therefore pricier). This of course runs the risk that such courses come to look and feel to students more like exactly the kind of school that they were trying to avoid – and so, as the statistics show, levels of attendance, engagement and completion tend to suffer.

Teaching of practical and vocational subjects is less intellectually demanding than teaching science or history

As a consequence vocational teachers are less esteemed, and often less well paid. Teaching hours are higher and remuneration lower in 'colleges' of further education than they are in 'universities' (and differences in nomenclature between further education and higher education mark these differences in value). One of the most common signifiers is the opposition between 'training' and 'education'. Those who merely *train* students to be able to change an oil filter or take old people to the toilet are doing a less demanding, less intricate, job than those who *educate* students about differential calculus or the causes of the First World War.

Each of these seven prevailing assumptions has grown up as a result of folklore, superstition and outdated scientific understanding. They are perpetuated by the cultural practices of schools and colleges, the

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values embedded in public examinations, and the repeated unthinking utterances of politicians and many curriculum planners and developers. And they seem very hard to shift. Despite widespread concern about these assumptions, expressed time and again over the last one hundred years, they stay, for the most part, stubbornly in place. Their resilience, in the face of repeated challenges, makes one suspect that they have deep cultural roots. To be effective in challenging and changing this particular kind of 'bad education', the first step has to be to dig around these roots and see where they run.

Descartes' error

To anyone looking inside a body, before about 100 years ago, it would have been just plain obvious that consciousness, reason and imagination could not arise from the machinations of any kind of meat, let alone the particularly dull-looking lump called the brain. Mind stuff was clearly different from body stuff. Minds were clever, conscious and sophisticated, while mere flesh was mechanical and simple. The 'housekeeping' processes with which bodies seemed mainly to concern themselves – breathing, digesting, contracting muscles and so on – did not warrant being called 'intelligent'. And minds were also capable of 'knowing God'; they had the capacity for purity and sanctity, while bodies were corruptible and unreliable. So minds were not only much more complex and intelligent than bodies, they were also 'higher'. The schism was both cognitive and moral – and unbridgeable. Descartes declared, for example: 'There is nothing included in the concept of the body that belongs to the mind; and nothing in that of the mind that belongs to the body'.[3]

This powerful attitude towards minds and bodies – 'Descartes' error', as neuroscientist Antonio Damasio has recently dubbed it – was born in classical Greece, strongly endorsed by the early Christian church, and turned into irrefutable 'common sense' by the learned philosophers of the Enlightenment, that period in our history when rationality was finally enthroned as the highest manifestation of our humanity.[4] 'Mind over matter', and especially over the physical matter of which we are composed, became the watchword. This disparity of esteem between the physiological and the intellectual became enshrined in the core

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social institutions of the Western world. Orthodox Christianity revolves around a struggle between our baser bodily impulses and our 'higher nature'. God gave us reason and 'free will' so we could overcome the sinful dispositions of the body, and be bettered by the struggle. The law's attitude to crime hinges on whether the accused is judged to have 'been in his right mind' – and therefore had the capacity (but not, evidently, the inclination) to override his antisocial impulse – at the critical moment. Medicine increasingly relies on measurement and machinery, while 'clinical judgement' born of experience is thought untrustworthy.

And for 100 years, schools value intellectual over physical gymnastics, and the mental over the manual. It was not always thus, as Sir Christopher Frayling reminds us:

> "The original meaning of [the 3Rs] was completely different in Regency times, at the beginning of the 19th century. The three Rs were reading, wroughting and arithmetic – in other words, literacy, making things and numeracy... And then, in the era of Mr. Gradgrind and the Great Exhibition of the 1850s, the wroughting got dropped in favour of writing.[5]"

Perhaps unsurprisingly, the middle classes who were to become the enthusiastic supporters and beneficiaries of grammar schools did not want their sons and daughters 'wroughting' when they could be practising the intellectual skills seen as the gateway to a more highly regarded and remunerated profession.

Of particular relevance is the way in which this image gives rise to a view of conscious understanding as senior to physical effectiveness. Comprehension is seen as prior to, and necessary for, competence. Not just 'doing', but being able to *explain* what you are doing, becomes a hallmark of intelligence. So arithmetic is not just a matter of being able to get the right answer, but of being able to 'show your working', and of having '*grasped the concept* of subtraction'. Indeed, it is sometimes assumed that you have to 'understand' something before you can put it into practice: that learning must proceed, as one model puts it, from 'conscious incompetence' to 'conscious competence' and only then to 'unconscious competence'.[6] Forty years ago, teacher trainers naturally assumed that lectures on the philosophy, psychology, sociology and

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history of education would somehow seep into the being of a training teacher, and then naturally manifest in enhanced competence in the classroom. The fact that they routinely did no such thing was ignored for decades.

While those deep-seated assumptions about both the *separation* of mind and body and the *primacy* of mind over body remain in place, attempts to generate 'parity of esteem' between so-called academic and practical learning are doomed to fail. For years, governments have tinkered with the structure, rhetoric and assessment of practical and vocational education. New diplomas try to blur the disparity of esteem, and courses in practical subjects are bulked up with gratuitous wodges of science or sociology. This attempt to raise the esteem of practical learning by trying to make it look more 'academic' rests on the very premise that needs to be questioned – that the more scholarly-looking the subject, the better it will be for getting on in life.

Examining the myths

Current cognitive science and neuroscience, however, are giving us quite a new image of the relationship between mind and body, and a vastly greater respect for the intelligent capacities of the meat of which we are made – especially that spongy kilo and a half between our ears called the brain. We are beginning to understand how 'mind' can indeed arise from matter; and how smart biological matter can be on its own, without any supervision, or even accompaniment, by conscious or rational thought. Let us briefly revisit the main 'myths' that contribute to the devaluing of practical learning, and see how they stand up in the light of current knowledge. (In the space available, we can do little more than offer tantalizing summaries and a few pointers towards further reading.)[7]

Is comprehension 'senior' to competence?

Antonio Damasio and his colleagues have shown that practical expertise is regularly distilled out of experience without any conscious understanding of the situation and its parameters. The ability to articulate what it is you have learned often arrives *after* you have learned to

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control and manipulate the situation, if at all. Indeed, the attempt to use conscious knowledge to guide learning frequently turns out to be counter-productive. The effort to apply what you *think* is going on, or what you have been told is going on, can actively interfere with the ability of your brain to pick up useful but subtle aspects of the situation just through attentive trial and error. In many complex arts and crafts, intuitive expertise and sensibility are often orders of magnitude more subtle than one is able to articulate – and necessarily so.[8]

There have been many experimental demonstrations of how 'thinking about what you are doing' is actually counter-productive. People who are actively prevented from conceptualizing what they are doing – golfers, in one study – actually perform better (under stress, for example) than those who have an articulate theory about what is going on. In many kinds of everyday problem-solving, people who have been *prevented* from thinking about information they have been given make better decisions than those who have been encouraged to think carefully. The relationship between conscious thought and intelligent action is much more complex and double-edged than is suggested by the out-of-date folk psychology on which much of education depends. Sometimes conscious thinking makes us more intelligent, sometimes less, and sometimes it is irrelevant.

Are practical trades and crafts undemanding of intelligence?

Of course occupations and activities differ in complexity, variability and unpredictability. Some 'assembly line' jobs are routine, repetitive and do indeed demand little cognitive resource. Some (like driving an underground tube train) are mostly routine, but require a constant vigilance for the non-routine, and a depth of flexibility and understanding to respond appropriately when necessary. Some afford a great deal of leeway in the degree of subtlety that a practitioner may apply. Working in a hotel kitchen may allow you to move between the freezer, the microwave and the serving area quite mindlessly, or to bring a good deal of skill and ingenuity to what you do. A politician being interviewed by a radio journalist may keep repeating today's party line, regardless of the

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questions they are asked, or may engage with what they are being asked in a much more fluid and thoughtful way. And some jobs absolutely demand a high level of knowledge, skill and flexibility, much of the time. The radio presenter has to keep thinking on her feet, just as the premiership footballer and the primary school teacher do.

However, it is also true that the *belief* that physical jobs are broadly 'menial' may stop us seeing, or looking for, such intricate intelligence as may be there. The assumption acts as a filter that makes us see what we expect to see. Examples of such 'top-down' perceptual bias are commonplace in psychology. So if we want to give ourselves the chance of seeing what intelligence is actually needed by a waitress or a mechanic, or what scope there is for individuals to serve or weld with greater sensitivity and imagination, we need to drop these filters and look afresh at what people actually do, rather than what we expect them to do.

In his book, *The Mind at Work*, American educational researcher Mike Rose has carried out such meticulous ethnographic observations in a range of vocational and professional settings, including a busy restaurant, a hairdressing salon, a carpentry shop and an operating theatre. He finds that such 'real-world intelligence' may be differently structured from more purely intellectual intelligence, but is certainly complex and intricate. Where an academic may be able to focus her mind on a single intellectual task – writing a paper or preparing a lecture, say – the intelligence in vocational settings commonly blends cognitive challenges such as planning, prioritizing and calculating with physical, emotional, social and moral challenges as well – and often in real time, under pressure. The waitress learns to walk and stand in a way that lessens physical strain, deploys mnemonic strategies to help her remember complex orders, uses imagery to tag the different dishes to the people round the table, notes (out of the corner of her eye) customers whose orders are overdue and are getting restless, and plans an economical route through the restaurant that enables her to have a friendly word with them, while also filling up water glasses and replacing items of cutlery. The apprentice carpenter has to carry out mathematical computations that, in a classroom, would have been quite straightforward, but which, in the workshop, are enmeshed in a complicated design process, being developed in real time, that makes the whole operation more intricate and demanding. There

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are people who got 'As' in their Mathematics exams who flounder in such a setting, just as there are people who did poorly on school tests, but quickly learn to cope well with the multidimensional pressures and tangible resources of the workshop.[9]

Is practical learning unsophisticated?

If the elegant problem-solving of the experienced tradesman or woman is worthy of respect, what about the processes of learning that delivered that package of physical, cognitive, social and emotional expertise? Is it defensible to see vocational learning as relatively simple and academic learning as more complex? Sometimes yes – but, if again we look with a clear eye, not by any means always. If we observe with a lens that is designed only to recognize academic kinds of learning – studying 'off-the-job', decontextualized discussion, written argumentation – then by definition the scholar will look a more powerful learner. The lens brings her learning activities into focus, while rendering other kinds of learning invisible or indistinct. Learning by imitation, by trial-and-error tinkering, or by careful attention to the present physical reality – this head of hair, this mass of pipework or this anxious old gentleman – may look crude when seen through the lens of scholarly learning, but on closer inspection they are nothing of the kind.

In his book, *The Craftsman*, Richard Sennett describes in detail the learning processes of a glass-blower trying to create a new kind of goblet. The dynamic interplay of heightened attention, specific experimentation, careful thoughtfulness and active imagination is clearly as complex, intricate and intelligent as the learning process of a lawyer preparing a detailed brief. For the latter, the medium of learning involves words, concepts and arguments; for the other it draws on a fluid orchestration of perception, action and reflection that includes, but is not limited to, conscious deliberate thinking. Indeed, in some ways the learning of the artisan is more sophisticated than that of the author or lawyer, for the latter has clear control of the medium, and can impose her will on the developing script, while the 'maker' may have to engage in a subtle negotiation with the refractory nature of the medium – this piece of wood has knots and whirls that must be treated in a particular way;

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the condition of this head of hair tells the experienced stylist that certain treatments will work and others will not. (Actually, the author too has to learn how to bend and shape her use of words to convey a new argument or understanding.) This subtle integration of what needs to be done (or said) with the diverse affordances and constraints of this material and this situation is surely the stuff of real intelligence – whether the 'stuff' is words or welds, or the context is a seminar room or a car body repair shop.[10]

Do we (need to) grow out of physical and imaginative learning?

Actually, academics and professionals learn by observation, imitation, tinkering and imagination just as much as plumbers and beauticians do. The junior lecturer teaches in a way that is a complex distillation – partly conscious, largely unconscious – of the styles she observed as a student.[11] The philosopher tinkers and crafts as he shapes a paper for a journal, just as the sculptor or the electrician adjust their designs as they go along. Surgeons think – but they also rely on highly developed powers of imagination, as this quotation makes clear:

> "[Before the operation] you just go out into the scrub sink where you are by yourself. You've got five minutes there. And all you're doing is just scrubbing your hands . . . and that's the time I'll try to piece together the anatomy with what I am about to do . . . I try to picture what I am going to see when I get there, because the x-rays are taken straight on or from the side, and we are coming in at a 20 degree angle to that. I try to combine those two views in my mind to make a three-dimensional image and rotate it into the view that you'll be looking at when you do the operation. And that is helpful . . ."[12]

In the real world, surgeons make use of their imagination just as much as architects and plumbers do. Business executives draw on their intuition when making decisions, just as much as fire-fighters and chefs do. Research chemists tinker and tune their equipment and their theories, just as jewellers, interior decorators and gardeners do. Of course, as we

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have said, some jobs afford or require greater intricacy of learning than others do – but this dimension of cognitive complexity does not map at all neatly onto the vocational – academic spectrum that runs from the plumber at one end to the professor at the other. To suppose they do is merely a matter of prejudice or intellectual laziness.

Is academic learning a better preparation for real-world learning?

Academic study develops skills that equip you to be a better student – just a BTec in 'health and social care' should equip you to learn more quickly how to manage a new group of young people with moderate learning difficulties. Learning to do something helps you learn how to do it better; but it does not necessarily help you to do anything else. There is scant evidence that academic study acts, in any way, as a better generic preparation than practical or vocational learning for coping with difficulty or lifelong learning. Scholarship is a specialized craft, just as caring is. Indeed, the amount of academic study pursued at school and college seems to have little or no beneficial effect on the clarity and rigour with which people think as they argue in the pub or discuss next summer's holiday round the kitchen table. Medical students' exam results do not correlate with their skill as clinicians, and air traffic controllers with higher academic qualifications do the job less well than those who are less academically accomplished.[13] The idea that studying History, Mathematics or Latin provides a powerful, generic training of the mind is an article of faith, not a proven fact. If anything, there are indications that the discipline of practical, physical learning and problem-solving may be a better incubator of useful, transferable habits of mind than academic study.[14]

Are 'vocational students' less able than their academic counterparts?

On the old view of the mind, vocational education is always second best. Students decide to follow the vocational route (typically at age 14) because they are not 'bright enough' to follow the academic. If they were,

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they would – so the story goes. However, there are at least two other common reasons why students choose a vocational path. They might enjoy practical, hands-on activities more than those that centre on reading, writing, thinking and talking; and they might have discovered that they derive greater satisfaction and pride from an object well made than an A grade essay. Or, they might be more impatient to leave school and take on the rights and responsibilities of adulthood, and the vocational route seems to offer them that opportunity more quickly. William Richardson sums up this third option:

> Large numbers of young people want to leave school at the earliest opportunity. They hate the uniform; they feel infantilised; they are aware of the adult world out there, beyond school, and are eager to join it. It's not just a matter of their interests or their mentality; the vocational route is the one that seems to respond best to that urgency.[15]

Unfortunately, there is no research that tells us the proportions of each of these three factors that contribute to the vocational choice. It is a sure bet, however, that the confusion between scholarly craft and aptitude on the one hand, and intelligence on the other, has caused a good many young people to be wrongly labelled 'low ability'. People who like to work with their hands, and are impatient to be treated as grown-ups, are unjustly stigmatized as 'unintelligent' as a result. Thus this aspect of 'bad education' is not just scientifically and pedagogically bad; it is morally bad too.

Conclusion: changes images of intelligence

These different kinds of research are leading us towards an expanded view of intelligence.[16]

Intellectual 'cleverness' – a mixture of abstract rationality, verbal dexterity, general knowledge and 'interesting opinions' – turns out not to be the be-all and end-all of intelligence; it is one specialized *kind* of intelligence that like all the other kinds has its uses and its limitations. The accusation that someone may be 'too clever by half' can now be scientifically underpinned.

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Some researchers are returning to a deeper view of intelligence – one that is more like the old Scottish idea of 'gumption'. The *Cambridge Advanced Learner's Dictionary* defines 'gumption' as 'the ability to decide what is the best thing to do in a situation, and to do it with energy and determination'. Robert Sternberg, for example, now argues that intelligence is not, at root, for reasoning and arguing; it is for getting things done that matter, in specific situations. Intelligence is the process that enables us, in the heat of the moment, to reconcile what we would like or need to do with what we can do, especially when normal routines and habits do not apply. Intelligence is what integrates our concerns, our capabilities and the opportunities that are open to us.[17]

In the jargon of the cognitive sciences, real-world intelligence is *embodied* and *embedded*. It is about reading situations and bringing to bear our skills and experience in a way that enables us to pursue our goals and interests with clarity and vigour. We think as we go along, and our thinking is intimately bound up with what we are seeing, feeling and doing, a process that some scientists have dubbed 'thinkering'.[18] Thinking is part and parcel of shaping a head of hair or tracing a blockage in a fuel line or a waste pipe. Chefs and carers need to think all the time, and the thinking they do is intricate, subtle and appropriate. Matthew Crawford, author of *The Case for Working with Your Hands*, has been both a policy wonk and a motorcycle repairman, and his book is a meditation on the intelligence of manual work. He says: 'There was more thinking going on in the bike shop than in my previous job at the think tank' – and he means more good, intelligent, sophisticated thinking.[19] Much of what passes for brainwork in writing position papers, contributing to meetings or giving lectures, for example, is merely describing and defending received opinions. A living made by talking and writing does not necessarily demand much intelligence – though those who suffer from what we have called 'anti-manualism', of course, will find Crawford's claim absurd.[20]

Only rarely in the real world do we need to stop and reason in the way that IQ tests demand, yet educators usually fail to tell their students *when* they will need to think like this, and when not. It has been shown, for example, that rational thinking only works well when there are a small number of clearly defined factors to be considered.[21] When we are doing something real and messy, like designing a garden or deciding

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which flat to make an offer on, it is more intelligent to heed our intuition than to rely solely on logical analysis because, for logic to work, it has first to cut the problem down to a size that it can manage, and in doing so, it runs the serious risk of distorting and oversimplifying the predicament.

It is also intelligent to take our time, to allow our brains to weave all the factors together in a way that does justice to the situation – yet IQ tests and final examinations only measure how well you can think *under pressure*, which is quite a different kind of skill.[22] That is why someone's IQ is no indication of how intelligently they will behave in practical situations.[23] We all know very clever people who are conspicuously lacking in horse sense. And unfortunately there is no test of horse sense in the civil service exams. The word 'gumption', incidentally, comes from the Middle English *gome*, which meant 'to pay attention, to heed, to have presence of mind' (and which also leads to the antithesis of 'gumptious' which is 'gormless'.

Overall, therefore, there seems no good reason not to treat 'being good with your hands' as a legitimate form of real intelligence. And when we do so, a whole set of traditional stereotypes and assumptions begin to look a good deal less secure than we had thought. For a number of reasons, practical and vocational education should begin to be given the genuine esteem it undoubtedly deserves.

Notes

1. For the purposes of this short chapter we are ignoring the 'in-between' cases of engineering, medicine, architecture and so on. There have a strong physical/practical component, but high status by virtue of the cultural value placed on their professions, and of the academic bodies of knowledge and research with which they are associated.
2. Department for Education (DfE) (2011) *A Framework for the Curriculum: A Report by the Expert Panel of the Curriculum Review*. London: HMSO.
3. Sommers, F. (1978) Dualism in Descartes, in M. Hooker (ed.) *Descartes*. Baltimore, MD: Johns Hopkins Press.
4. Damasio, A. (1995) *Descartes' Error*. New Cork: Quill. For the history, see Dodds E.R. (1951) *The Greeks and the Irrational*. Berkeley: University of California Press; Claxton, G. (2007) *The Wayward Mind.* London: Little Brown.
5. Sir Christopher Frayling, Rector of the Royal College of Arts, interviewed in *The Guardian*, 29 June 2004.

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6. This theory is widely taught and quoted in the commercial 'learning and development' business, though its exact provenance is uncertain.
7. See, for example, Damasio, A. (2011) *Self Comes to Mind: Constructing the Conscious Brain*. New York: Pantheon; Tucker, D. (2007) *Mind from Body: Experience from Neural Structure*. Oxford: Oxford University Press; Pfeifer, R. and Bongard, J. (2007) *How the Body Shapes the Way We Think*. Cambridge, MA: MIT Press.
8. The studies referred to in this and the following paragraph are described in more detail in Claxton, G. (1997) *Hare Brain, Tortoise Mind: Why Intelligence Increases When You Think Less*. London: Fourth Estate.
9. Mike Rose (2004) *The Mind at Work: Valuing the Intelligence of the American Worker*. New York: Penguin.
10. Sennett, R. (2008) *The Craftsman*. London: Allen Lane.
11. Molyneux-Hodgson, S. (1999) Is authentic appropriate? In J.T Leach and J. Paulson (eds) *Practical Work in Science Education*. Amsterdam: Kluwer.
12. Brown, C. (2001) The cutting edge: performance psychology with surgeons. Paper presented at the American Psychological Association Annual Convention, San Francisco, 17–20 August.
13. Perkins, D.N. (1985) Post-primary education has little impact on informal reasoning, *Journal of Educational Psychology*, 77(5), 562–71; Wingard, J.R. and Williamson, J.W. (1973) Grades as predictors of physicians' career performance: an evaluative literature review, *Journal of Medical Education*, 48(4), 311–22; Berg, I. (1970) *Education and Jobs: The Great Training Robbery*. New York: Praeger.
14. See Sennett, op. cit.; Rose, op. cit.
15. Williamson, R. (2010) Quoted in B. Lucas, G. Claxton and R. Webster (eds), *Mind the Gap: Research and Reality in Practical and Vocational Education*. London: Edge Foundation.
16. See Lucas, B. and Claxton, G. (2010) *New Kinds of Smart: How the Science of Learnable Intelligence Is Changing Education*. Maidenhead: Open University Press.
17. See, for example, Sternberg, R. (2000) (ed.) *Practical Intelligence in Everyday Life*. Cambridge: Cambridge University Press.
18. *Urban Dictionary* (www.urbandictionary.com/define.php?term=Thinkering): 'to think about something by tinkering with objects related to the problem under consideration ... often a very good way to explore aspects of difficult problems or to find solutions where none are obvious'. The word thinkering was coined by Ondaatje, M. (2004) *The English Patient*. London: Bloomsbury.
19. Crawford, op. cit., p. 27.
20. Claxton, G. and Lucas, B. (2011) Anti-manualism, in J., Mullen and C., Hall (eds) *Open to Ideas: Essays on Education and Skills*. Policy Connect: London.

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21. Dijksterhuis, A. and Nordgren, L. (2006) A theory of unconscious thought, in *Perspectives on Psychological Science*, 1(2): 95–109.
22. Stanovich, K. (2009) *What Intelligence Tests Miss*. New Haven, CT: Yale University Press.
23. Scribner, S. (1984) Studying working intelligence, in B., Rogoff and J., Lave (eds) (2000) *Everyday Cognition*. Cambridge, MA: Harvard University Press.