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Elements of a Science of Education

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Introduction

This conference is being held in the old electoral territory of Gough Whitlam at the thirtieth anniversary of the fall of his government. At the rhetorical heart of his prime ministership were the beliefs that education could be a modernising force and that it could be a means to achieve a just and equitable society. The Whitlam era was also a high point in the push to 'progressivist' approaches to schooling and pedagogy, as exemplified by the work of the Australian Schools Commission.

Over the decades that have since elapsed, the public rhetoric around education has shifted considerably. Today the mantra is freedom and choice, and these articles of neoliberal faith have been translated into a market-oriented view of education. In these decades, some aspects of progressivism have been developed and extended, in the form, for example of a broader and more flexible curriculum and a more learner-centred approach to teaching and learning. However, in the same time we have also witnessed a contrary push 'back to the basics'. This has manifest itself in a focus on high stakes standardised tests, curriculum to fit, and the re-emergence of pre-progressivist conceptions of what constitutes worthwhile knowledge and good schooling.

Education has become a domain of considerable ideological division. I want to trace the contours of this division by taking two steps back from the contemporary fray. One step is to situate present day discussions in a larger historical context. In this context, today's points of debate and disagreement are not so new. The other step is to interrogate the protagonists' underlying understanding of the nature of knowledge, in other words their epistemological assumptions.

Who, then, are the protagonists? I am going to describe three paradigmatic approaches to education: 'didactic', 'authentic' and 'transformative'. Each has a history. Each has an underlying epistemology.

The earliest forms of modern institutionalised education were 'didactic'. Far from being a thing of the past, however, the didactic is well and truly alive today. I want to use the word 'authentic' – or a certain trueness to real learners and their actual lives – to describe the response to didactic education of a progressivism that is now a century old. Whitlam's educational initiatives in Australia were one instance of that progressivism. And then thirdly, I think we are now standing at a profound turning point in social life in which authentic education is at best partial and at worst inappropriate to contemporary social conditions. This turning point demands that we consider new approaches to education which I will call 'transformative' – transformative in the sense, first, of enabling learners to live successful lives in dramatically changed social conditions and second, in the sense in which both learners and teachers can assume an active role as designers of the newly emerging social world.

This turning point may prove to be hugely significant in social terms and in the impact of social changes on education. So finally, I also want to reflect on the nature of the discipline of education. What is the nature of our discipline? What shape are we in as a discipline? How do we develop the intellectual fortitude we are going to require, not just to face the challenges of the near future, but to take an active role in the social transformations we are facing? To conclude, I will argue that education should conceive itself as a science, and suggest the constituent elements of a science of education. The time is ripe to open out the intellectual scope and ambition of education as a field of intellectual endeavour and social invention.

Didactic Education

The word 'didactic' finds its way into English from the Greek 'to teach'. In English, however, its meaning has come to have a particular loading. Being didactic means to spell things out explicitly but perhaps a little too laboriously, or to present a view of what's true or right or moral but in a way which might at times appear dogmatic. The focus of didactic teaching is on what the teacher does rather than what the learner does. The balance of agency thus weighs heavily towards the teacher's side. The teacher is in command of knowledge. Their mission is to transmit this knowledge to learners, and learners, it is hoped, dutifully absorb the knowledge laid before them by the teacher.

Modern, mass-institutionalised education begins in the didactic mode. In practical terms, these were its dimensions:

- *Architectonic Dimension:* The classroom of thirty or so students facing one teacher.
- *Discursive Dimension:* Teacher-dominated classroom talk, most learners silent for most of the time.
- *Intersubjective Dimension:* Authoritarian: systems, syllabi, textbooks and disciplines command, and the teacher is the mouthpiece; teachers command and learners obey. The teacher's subjectivity dominates; the learner is subservient.
- *Socio-cultural Dimension:* All thirty or so learners regarded for practical purposes as the same, one-size-fits-all curriculum and pedagogy.
- *Proprietary Dimension:* Private spaces: 'my classroom' (teacher) and 'my work' (learner).
- *Pedagogical Dimension:* Teachers as transmitters, learners as passive receptors of knowledge. Teacher as medium for the syllabus; textbooks speaking singularly for the discipline. Learners learning what they have to learn: facts, theories, truths, civic values.
- *Moral Dimension:* Discipline and conformity leads to success; and blame yourself for failure.

And why? Didactic education was in a certain sense 'right' for a world of hierarchical work organisations based on chains of command, where citizenship demanded uniformity and unquestioning loyalty, where people consumed mass produced commodities that were supposedly good for them and where exemplary cultural narratives were to be listened to and appreciated. The ideal citizen of the strong state was compliant; the ideal worker of the capitalist or communist industrial enterprise was compliant; the ideal learner in the classroom of disciplined knowledge was compliant.

And what was the underlying epistemological mode? Didactic pedagogy's primary epistemological mode is mimetic. Mimesis is the process of imitating or copying. The Greek root of the word also finds its way into English in the word 'mimic'. The mimetic epistemological mode of didactic pedagogy is realised in its processes of repetition, replication and reproduction of received knowledge.

The founder of the Western monastic tradition, St Benedict, framed the mimetic roots of didactic pedagogy in these straightforward terms:

> For it belongeth to the master to speak and to teach; it becometh the disciple to be silent and to listen. If, therefore, anything must be asked of the Superior, let it be asked with all humility and respectful submission (St Benedict, c.530 (1949, Chapter VI).

However, even in the didactic mode, in the most authoritarian of transmission pedagogies, the learner's subjectivity is never entirely extinguished. Not even a St Benedict would want or believe this. Learners are never entirely passive, readers and listeners never read and hear texts without their own experience bringing to bear a peculiar reading or hearing. Received knowledges, no matter how insistent and dogmatic, are always open to some degree of reinterpretation. Indeed, as Gunther Kress points out, all representation or processes of meaning making are transformative (Kress 2000). Representation is an act of appropriation of the world which never leaves the world precisely the way it was, be that representation to another in the form of communication or representation to oneself in consciousness.

In curriculum, an epistemology of mimesis translates into the following view of knowledge: There are definite facts in the world. These are not directly accessible to learners in an educational setting. The reference point of learning is necessarily outside of the classroom – the facts of science, the events and dates of history, the places of geography, the formulae of mathematics. These facts are presented in curriculum and learnt by rote. They can be packaged into theories which sum up what humans know, such as the narrative of history or the discipline of science. Only experts possess the capacity to test and re-evaluate these theories against the facts, and these bodies of knowledge remain fairly stable over long periods of time. In school, these form the basis of the disciplines which we teach as received knowledge, as revealed through general outlines, abstract generalisations or syntheses of the inner structures of knowledge. Underlying these theories are 'Reason' with a capital 'R' and 'Truth' with a capital 'T'. 'Reason' and 'Truth' are embodied in received canonical knowledge. The learner could not possibly construct for themselves the edifice of science or the word of God? So they need to be presented with 'Truth' as found in canonical texts – in great literature or sacred texts which have stood the test of time and been proven by their very durability to be deeper than mere fashion. This 'Truth' can be absorbed by immersion in these texts, the traditionalist view of learning from 'the greats'. Underlying this epistemology are some moral and human absolutes, be they enlightenment (rational or religious), humanism or progress. As a non-expert (in relation to science) or a member of the congregation of the faithful (in relation to religion), the learner has a limited capacity to build reason for themselves. Reason exists, but external to individual subjectivity. An individual's reasoning capacity must be subservient to faith – in experts or in received religion.

The mimetic epistemological mode underlies didactic pedagogy. In this mode, the sources of definitive knowledge are external to the learner and even the classroom. As a consequence, the balance of subjectivity in the process of knowing favours the teacher, the expert and the discipline over the learner.

We may wish to argue that such an epistemological frame is inappropriate to our times in which there has been a readjustment of the balance of subjectivity in our civic, working and personal lives. However, the mimetic frame also finds a number of seemingly comfortable places in our contemporary world. One place is in the 'back to the basics' movement in education, which seeks to return us to an earlier modernity when the rigour and standards of disciplined learning apparently ruled. It also finds champions in the new and burgeoning social movements of fundamentalist religion.

I was working in a public school recently which is, in the less than ideal circumstances of Western Melbourne, valiantly trying to push ahead with innovation in teaching and learning. The response of the young, pregnant woman who had been dux of her school and who was now a local councillor was that she was a 'rows person' – she had been used to sitting in rows at school and was comfortable with that. But she meant more than literal rows, she meant an ordered way of representing knowledge and trusting authority. So, didactic pedagogy is well and truly alive in our political discourse and everyday consciousness.

Authentic Education: The Modernist Turn

From the beginning of modern mass-institutionalised schooling, didactic education attracted its share of critics. These can be broadly grouped under the term 'progressivism'. Systematic criticism of didactic education, and the modelling of alternatives, began in Dewey's Chicago and Montessori's Rome. This tradition lasts though to today's 'constructivism'. In Australia, the 1970s was a moment of progressivist flowering. The Australian Schools Commission started producing radically new kinds of curriculum such as the Social Education Materials Project. New syllabuses were published which advocated inquiry learning such as the IODE (Input-Organise-Demonstrate-Express) approach in the New South Wales Social Studies Syllabus of 1975. The idea of 'negotiating the curriculum' with learners started to circulate, an idea popularised by South Australia by Garth Boomer, who was later to join the Schools Commission in Canberra (Boomer 1982). And we encountered for the first time the 'process writing' and 'whole language' approaches to literacy. Progressivist pedagogy was three quarters of a century old or more when Whitlam came to power, if we take Dewey and Montessori to be its iconic founders. However,

the sixties and seventies were a period in which progressivism flowered and was institutionalised in many modernising education systems around the world.

What does progressivism mean? As an approach to education and in direct contrast with didactic education, it is 'authentic' in several respects. First, progressivism is authentic in the sense that learning is not merely abstract and formal as are the 'disciplines' of didactic pedagogy. It is of relevance to the lives of learners; it has demonstrably practical uses. Here is Dewey, speaking in 1915:

> [By] the introduction into the school of various forms of active occupation, ... the entire spirit of the school is renewed. It has a chance to affiliate itself with life, to become the child's habitat, where he learns through directed learning, instead of being only a place to learn lessons having an abstract and remote reference to some possible living to be done in the future. It gets a chance to be a miniature community, and embryonic society. To do this means to make each one of our schools an embryonic community life, active with the types of occupation that reflect the life the of larger society.
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> [H]ow shall we ... introduce into the school ... occupations which exact personal responsibilities and which train the child in relation to the physical realities of life? [For] such work engages the full spontaneous interest of the children. It keeps them alert and active, instead of passive and receptive; it makes them more useful, more capable, and hence more inclined to he helpful at home; it prepares them to some extent for the practical duties of later life—the girls to be more efficient house managers, if not actually cooks and seamstresses; the boys ... for their future vocations (Dewey 1915 (1956), pp. 12-13, 18, 29).

Second, progressivism is authentic insofar as it is learner- or child-centred, true to the interests and motivations of the learner in preference to the dictates of the teacher, syllabus and textbook. And third, it is authentic for its focus on truly internalised understanding over formal correctness, understanding the processes of reasoning behind a mathematical formula, for instance, not just producing the right answer.

These are the dimensions of authentic education:

- *Architectonic Dimension:* Making the most of old classrooms, changing the arrangement of the room to allow more student activity.
- *Discursive Dimension:* Some student-to-student dialogue, but within the practical bounds of the classroom.

- *Intersubjective Dimension:* Child-centred learning, learner-centred activities.
- *Socio-cultural Dimension:* Some self-paced learning, recognising individual learner differences to the extent that this is possible; initiation to mainstream culture through common curriculum; deficit views of student differences; social integration. Perhaps some moves towards tokenistic recognition of differences, such as a superficial multiculturalism.
- *Proprietary Dimension:* Opening up the classroom, some group work: partial redistribution of ownership of knowledge and control of space.
- *Pedagogical Dimension:* Experiential learning, learning how to learn. Students as inquirers, expanding the scope of school learning, cross-disciplinary learning.
- *Moral Dimension:* Inquiring minds and participating citizens; 'opportunity' to access the 'mainstream'.

Whatever its claimed superiority over didactic education, this more authentic education has its own intrinsic limitations, whether it's in its original modern turn-of-the-twentieth century form as articulated by Dewey and Montessori, or its Whitlamesque 1970s Australian form, or its contemporary form as expressed in the mantras of 'constructivism'.

Authentic to what? one might ask as an initial question. To which progressivism might reply, 'whatever'. Whatever teachers negotiate with learners and whatever communities might seem to need or think they need. Something new or the same old stuff if teachers and parents have warm memories from their own school days of spelling lists and times tables and stories about Captain Cook. And if it's something new, it might be carefully differentiated curriculum for different kinds of learners, Shakespeare in subject English for those who might become doctors and lawyers, and 'Communication Skills' for those who are going to become somebody's clerical assistant and who may need to be taught how to write a half-reasonable CV. 'Communication Skills' sounds good and is doubtless 'relevant', but the kids know what being in this course really means when they call it, in tones of publicly unspeakable contempt, 'veggie English'. Authentic means streaming society in new and more subtle ways in the name of relevance. The 'democratic' of this kind of democratic schooling translates into a kind of populism, a series of seemingly democratic tricks and tropes which in fact keep the social order just the way it is, and that is unfairly unequal. Authentic pedagogy takes a course which, in the final analysis, stays true to an unequal society. It's just a somewhat kinder, gentler course. It represents a view of the world which is ultimately agnostic, neutral, disengaged.

Whereas didactic pedagogy chooses to gloss over differences, authentic pedagogy relates to learner differences in one of two ways: a deficit view, as something that carefully tailored and compensatory pedagogy might at least in part overcome; and a tokenistic multicultural view. In a fascinating way, the Schools Commission moves from the first to the second view over the course of the 1970s (Kalantzis et al. 1984). In its initial 1973 report, the Commission said that 'poverty is usually regarded as disadvantage by those who experience it' and 'the measure of Aboriginality and migrancy are both correlated positively with socio-economic disadvantage'. This disadvantage can be redressed by special programs, delivering 'basic skills necessary to participate in the society' and programs that foster 'initiation into the cultural heritage'. These will 'broaden opportunities for participation in the mainstream of society' (Australian Schools Commission 1973, pp. 9.13, 9.27, 3.23, 2.21, 3.23). When reduced to generic disadvantage, differences such as Aboriginality and immigrant background – deficits in reality if not named as such in the report – can at least be partly overcome by compensatory programs which will improve access to the mainstream culture. Earlier in the twentieth century and in the same spirit, John Dewey had spoken positively of 'the assimilative force of the American public school' (Dewey 1916 (1966), pp. 21-22) in a society of mass immigration. This is an essentially modernist vision of education.

I will come back to the shift towards a multicultural (and postmodernist) view of differences shortly, but let me mention constructivism briefly, and its partial avoidance of learner differences. Constructivism – as our contemporary variant of authentic pedagogy – blandly suggests we bring learner agency into the educational picture. But it's as if we can give all learners the same dose of agency, commensurate with their stage in the template of human developmentalism. Constructivism's agent is the universal individual personality, stripped of its significant differences. In this sense, classical constructivism is modernist in its foundational assumptions. Presented with a digital learning object, a learner will act in ways which are not fundamentally different. They will click and flick, apparently navigating a learning path on their own, building their own understanding in the highly fabricated and manipulative environment of stimulus and response. The environment is designed, however, for the generic individual who will get the gist, go with the flow, of the designer's intentions.

We educators have been struggling for a century now to develop a new dynamics of agency, starting with the progressivisms of John Dewey and Maria Montessori. Constructivism is derived from a twentieth century psychological canon in which Piaget's theories dominate. However, the emphasis of constructivism is upon the level and extent of receptivity at a particular age or at a particular cognitive stage – and age differences are about as far as it goes. The raw materials of 'intelligence' are

biologised, and variations were accounted for in terms of individualised 'capability' and the increments of what was supposed to be innate, universal development. Today, the cognitive sciences all-too-often do a similar psychological job.

These are some of the ways in which authentic education works, and, I would argue, also the roots of its limitations. What is its underlying epistemological mode? I want to call this 'synthetic'. To be sure, authentic education shifts the balance of agency towards the learner by allowing them space to appropriate and rework knowledge, but only to a limited extent. By 'synthetic' I mean that the learner can deconstruct the world, and even reconstruct the world, but only in a way that leaves themselves and the world more or less unchanged – the progressivist busywork where learners fill the day with activity but don't really learn new things, the 'relevant' courses which engage learners, to be sure, but do not extend their capacities or broaden their life horizons. Learners actively piece together bits of knowledge but only from what has been presented to them, and then their synthesis often amounts to not much more than second guessing what's in the teacher's head, in the curriculum's rationale, in the discipline's logic. The synthetic mode, in fact, may be little more than another method for reaching the same curricular and disciplinary ends as didactic education and this may, in fact, have been possible via the less circuitous route of the mimetic mode.

I want to distinguish two variants of the synthetic epistemological mode, a modernist variant and a postmodernist one. The modernist version of synthetic epistemology runs liken this: Facts can be discovered through the methods of science or history, for instance. Hence, we can safely assume a 'realist' view of knowledge, mixing a measure of John Locke's empiricism (we learn from our sense perceptions) with Francis Bacon's experimentalism (we learn by trial and error) in order to discover, after a fair bit of hard work, the 'objective facts' of the 'real' world. Behind this view lies an overly simple empiricism. In a real world of all-too-many facts, and all-too-contradictory. So, we are doomed to discover the facts are what we are inclined to find. In research, we get answers appropriate to our questions. In school, it is the teacher or knowledge authority who directs the learner's inclinations. Facts never simply speak for themselves; they are not simply waiting inertly, ready for learners to synthesise.

Received theories help us in the process of making meaning of factual complexity, of synthesising the world as found. We might be constantly testing these theories (Karl Popper's falsificationalism) and they may change over time (Thomas Kuhn's paradigms). However, theories – the metanarratives of our culture, such as the modernist metanarrative of science – are fundamentally stable. Faced with the overwhelming complexities of the world, the not-so-accidental result of every learner's syntheses happen to look remarkably like the received metanarratives that

are written into our disciplinary and cultural discourses. We think we are constructing the world through our synthetic activities, but we are really only reconstructing found metanarratives. And, so metanarratives remain unchallenged and their commonsense rules are internalised. We think we have invented the wheel when we have only reinvented it. At most, we might tinker with the main intellectual paradigms, but the result of his tinkering is to do little more than leave these paradigms just as they are. This is the fruit of our synthetic labours, the conservative hidden curriculum of authentic pedagogy.

In this view, man is the measure of all things, and for classical modernism that's mostly 'man' in the singular and masculine. Reason with a capital 'R' is the expression of the power of the intellect, as Rene Descartes or Immanuel Kant would have it. And this reason is universal. Given the power to think logically, to think hard enough and long enough, all people should come up with the same rational answers. And so, in an authentic pedagogy, the cognitive syntheses of the ego become the measure of all things. Child- or learner-centred pedagogy puts the ego at the heart of the synthetic process.

And, although universal truth can no longer be reverentially absorbed by immersion in canonical texts, there is in the modernist view another kind of authenticity or truth in textual processes – literary criticism, self-expression, finding personal voice. But in this is a quite singularly liberal view of textuality, a subtly dogmatic hidden curriculum may emerge, and this despite the highly active, synthetic process of textual knowledge and self-knowledge being advocated. Hence the subtle closures of whole language and process writing, written into its cultural assumptions about individual authorial voice (Cope and Kalantzis 1993).

But what happens when that ego, that reasoning individual, the individual authorial voice comes up with the much the same answers and speaks in much the same way as everybody else? Common sense which produces the same answers time and time again presents itself as a conspiracy against the individual. When lots of learners come up with the same 'right' answers as a result of their syntheses, have they been subtly manipulated, or is this a sign that the individual, the cognising ego, is a conceit?

The actor's synthetic responsibility in knowledge-making is a norm. This is the ethical stance of modern reason. It stands in contradistinction to the passivity of mimesis. So, the synthetic medium of authentic pedagogy is its message. To hand power over to social actors at the expense of traditional sources of authority, is a moral decision. 'Typical of the consumer society', or 'typical of the permissive society', or 'typical narcissistic ego-centrism', you might say if you disapprove of the move. Or 'democratic' and 'empowering' if you approve. Either way, it's a characteristically modern moral decision.

Authentic Education: The Postmodernist Turn

A funny thing happened in Australian education from the late seventies, and multiculturalism is a touchstone of the change. The Fraser Government came to power in December 1975. It keeps many of the Whitlam Government initiatives, one of which is the Schools Commission. However, the Fraser Government takes a new course on immigration and refugee policy. It accepts that Australia has a responsibility to take its share of Asian refugees from the Indo-Chinese war. Multiculturalism was an invention of this moment. It produced a fundamental shift in the social and educational discourse on difference. Difference was a deficit no longer. We could no longer simply demand that those who are different assimilate or integrate themselves into the mainstream. 'Multiculturalism is interesting and colourful, and offers many choices of lifestyle', said a key government document. Multiculturalism's agenda was reasonable and modest. It 'does not create new differences, but recognises and caters for those that already exist. The open-ness of our society allows Australians to hold many different and subsidiary identities ... . One can be an Australian, and, for example, a Muslim, a Rotarian, a Queenslander and a Collingwood or Manly football supporter' (Australian Council on Population and Ethnic Affairs 1982, pp. 15, 16-17). So, in schools, we can and should introduce 'the geography, history, cultural traditions, folklore, folk song and dance' of migrants' countries of origin (Commonwealth Schools Commission 1979, p. 22). 'Cultural pluralism ... can help overcome or prevent the insecurity, homogenisation and loss of personality characteristic of mass society' (Commonwealth Education Portfolio 1979, p. 11).

This is another variant of authentic pedagogy. Whereas the modernist variant glossed over differences, the postmodernist variant makes them a point of focus. It is authentic in the sense that it attempts to stay true to the differences it encounters. Its weaknesses, however, are its tokenism (national days with exotic food and dance or special country studies at the fringe of the curriculum), its patronising relativism (what an interesting way to live, but it's not for me), and its function as an alibi for neglecting the inequalities that underlie difference. All too often, it is a mere gesture to difference, a kind of postmodern tinkering which turns the teacher into a pedagogical *bricoleur* – an 'odd-job man' making up curriculum from cultural shreds and patches – but which does little to enable learners in any significant ways.

Underlying this is a shift within the synthetic epistemological mode from a modernist to postmodernist synthesis. The postmodernist version of synthetic epistemology runs likes this: You can perceive only what you are looking for. This is the postmodernist or poststructuralist view of facts. You only look and find for what the culture, or your own life experience, or the teacher, tells you to. The facts are forever framed by what you want to find or are inclined to see, by perspectives and interests, your own or your culture's. The world only appears to be objective and real. As Richard Rorty or

Jean-Francois Lyotard would tell us, the world is actually a figment of our many-sided and infinitely variable languages and discourse. We know the world through the ways in which our particular languages or discourses frame the world. Behind this view, however, is an overly simple subjectivism. Knowledge is reduced to competing perspectives, none of which can be better than any other. Then, for instance, the Darwinian view of natural history agreed by most scientists is no better than the view of 'intelligent design' promoted from the pulpits of fundamentalist churches.

Such a postmodern or poststructuralist scepticism, may raise our suspicion of dominant metanarratives and habits of mind, and particularly when we discover that they leave out the knowledge and perspectives of those who are not powerfully positioned – the poor, or women, or minorities, or gays. The dominant theories or paradigms happen to have been made by dead white males. If we grant equal validity to other views, no view has priority. Competing interpretations from such varied perspectives seem to cancel the pretence each has to Truth – how can religions square up against each other, and science against religion, and one political or personal perspective against another? And what is the role of the reader, Roland Barthes and Umberto Eco might ask, who may interpret the same text or theory in very different ways? Theories and metanarratives do not simply speak unequivocal truth, to be absorbed by learners in an unmediated way. Instead, the likes of Michel Foucault or Jacques Derrida would warn us that we should approach theory and metanarrative with a critical eye, deconstruct or dismantle their premises, trace their genealogies and measure them against the practical stuff of power and interests. Then we might uncover the limitations and pretences of universalising, totalising master narratives. What then are we left to teach and to learn? Our suspicion of overarching metanarrative might ironically lead us to retreat to the dogmas of our narrow positions (my fundamentalism, your liberalism; my woman's voice, your man's).

And what of texts? Here, too we may lapse into the dedicated doubt of postmodernism and poststructuralism – there can be no inherent truths in texts or processes of reading or making texts. The texts of the canon speak of many, contradictory truths. But who is to say the canon has a special status? One person's canon is another person's irrelevance (Cope and Kalantzis 1997b). A person's reading of a text – what they see in it, and don't see in it – depends on their experiences and interests, their reading position.

Perhaps then, to take a postmodernist scepticism still further, the universal, reasoning individual does not exist as such. Maybe we should focus on our differences, instead? In this view, there is no universal man who can measure everything from the point of view of a single-minded 'Reason', valid for all people and all times. Rather, there are interpretations in the plural, the products of different bodies (sex, sexuality, age),

and different life experiences (class, ethnicity, gender). Varied subjectivities is all there can be.

But is this a recipe for chaos and fragmentation? Where are standards, ethics and norms? From a postmodernist or poststructuralist perspective, you might protest that there can and should be no final or definitive norms. No apparently factual assumption should lie unquestioned, no apparently definitive theory remain unchallenged. If there is any truth at all, it is that there is no fixed and final truth. The critical is the only norm – uncovering perspectives, interrogating facts, testing theories. This, however, leaves us agnostic about the validity of knowledge.

Despite the shift in the balance of agency, both modernist and postmodernist epistemologies leave the learner and the world substantially the way they are. They are both synthetic – but no more than this. Learners put things together, but only from what is made available to them. They are active knowledge makers, but mainly to second guess the teacher's, the curriculum's or the discipline's answers. They deconstruct knowledge but only to reconstruct it more or less in its received form. This is not enough for a society which now puts so much store on discernment, creativity, innovation, responsibility and participation.

Transformative Education

> Transforming schools ... is both a very broad and a narrowly specific issue, a critical part of a larger social project. ... The broad question is, what will count for success in the world of the imminent future, a world that can be imagined and achieved? The narrower question is, how do we transform incrementally the achievable and apt outcomes of schooling? How do we supplement what schools already do? We cannot remake the world through schooling, but we can instantiate a vision through pedagogy that creates in microcosm a transformed set of relationships and possibilities for social futures, a vision that is lived in schools. This might involve activities such as simulating work relations of collaboration, commitment, and creative involvement; using the school as a site for mass media access and learning; reclaiming the public space of school citizenship for diverse communities and discourses; and creating communities of learners that are diverse and respectful of the autonomy of lifeworlds (New London Group 1996, p. 72-73).

After a century of modernist then postmodernist progressivism, I think it is time to consider a 'New Learning', which is not merely authentic, but transformative. The

authentic leaves the world fundamentally the way it is. It does not necessarily set out to move the learner in intergenerational terms or in terms of life trajectory, if at all. Transformative education builds on the insights of authentic pedagogy, to be sure, but ups the ante.

These are the dimensions of a transformative education:

- *Architectonic Dimension:* Flexible spaces, no physical boundaries, lifewide and lifelong learning.
- *Discursive Dimension:* Horizontal, learner- learner and learner-teacher dialogue, with the teacher in an authoritative position.
- *Intersubjective Dimension:* Learner-surrounded interactivity. Multiple teacher-learner relationships.
- *Socio-cultural Dimension:* Inclusive learning, pluralism.
- *Proprietary Dimension:* Collaborative learning—anywhere, anytime.
- *Pedagogical Dimension:* The teacher as a designer of pedagogy; the learner as co-designer of knowledge; the learner as co-designer of learning. Learning as a variety of knowledge processes, acts of knowing, epistemological 'takes'.
- *Moral Dimension:* Kinds of persons who can navigate, discern, change, negotiate deep diversity, and who can create and innovate. Learners as collaborators and the morality of compromise in the context of a pluralistic society.

And what's the politics of transformative education? It embodies, I would argue, a realistic view of contemporary society, or the kinds of capacities for knowing that children need to develop in order to be good workers in a 'knowledge economy', participating citizens in a globalised cosmopolitan society, and balanced personalities in a society that provides overwhelming choices and restrictions. Make of this what you will, be that a sensible conservatism (sensible for being realistic about the contemporary forces of technology, globalisation and cultural change) or an emancipatory view which wants to make a future that is different to the present by addressing its crises of poverty, environment, cultural difference and existential meaning.

Whether the transformation is pragmatic (enabling learners to do their best in the given social conditions) or emancipatory (making the world a better place), I want to situate our current educational challenges in the context of our contemporary social moment. My question is this: what's new about our moment which means that the didactic is by and large an anachronism and that, although the authentic may be a shift in the right direction, it is not far enough?

The key, I believe, is a ground-shift in the balance of agency, not just in schools but in the wider society. I want to argue that today's social transformations are of such depth and significance that they demand a fundamental rethinking of the nature of education. A key to much contemporary social change is to be found in the nature of subjectivity, where as citizens, workers and cultural beings, we are more and more required to be users, players, creators and active consumers more than spectators, delegates, audiences or passive consumers.

In the domain of citizenship, we witness the emergence of increasingly critical self-governing structures of civil society. Whatever the root causes – small government conservatism, globalisation, or the new dynamics of a post cold-war world – the realities of this change are everywhere to be felt. The society of self-regulating community – civil society – is becoming a more significant locus of action and decision. The Internet is governed, not by any state, but the community of experts and interested parties that is the World Wide Web Consortium. Diasporic communities are governed, not by home governments, but by highly distributed community organisations whose points of connection are common cultural principles. In education, we are witnessing the rise of community and private schooling and the self-managing public school. And the need for teaching to become an increasingly self-regulated profession. As the state contracts, there is no alternative to creating governance structures within the communities of practice of civil society. When a greater capacity to decide and act is devolved to civil society, a higher level of participation and reflexivity is required of citizens.

At work, crude command structures are replaced by a more sophisticated cultural co-option – the co-option of team work, vision and mission and corporate culture, in which everyone is supposed to personify the enterprise, to think and will and act the enterprise (Cope and Kalantzis 1997a). The workplaces of the near future will simply be uncompetitive if their workers do not contribute their all, from their creative potential to their ability to maintain relationships of supple reflexivity across the myriad of niched customers and affiliates.

In our lives as cultural beings as well, there has been a profound shift in the intersubjective balance of power. Take something so ordinary and pervasive as narrative. In everyday family and community life, the narratives of gaming have become a bigger business than Hollywood. From the most impressionable of ages, children of the Nintendo, PlayStation and X-Box generation have become inured to the idea that they can be characters in narratives, capable of determining or influencing the story's end (Gee 2005). They are content with being no less than actors rather than audiences, players rather than spectators, agents rather than voyeurs, users rather than readers of narrative. Not content with programmed radio,

they build their own play lists on their iPods. Not content with programmed television, they read the narratives of DVD and Internet streamed video at varying depth (the movie, the documentary about the making of the movie) and dip into 'chapters' at will. Not content with the singular vision of sports telecasting of mass television, they choose their own angles, replays and statistical analyses on interactive digital TV. Meanwhile, the auto-creative potentials of the digital media and the 'semantic web' have only just been opened with phenomena such as blogging. These potentials create new economies of cultural scale, geographies of distribution and balances of cultural power. The costs of owning the means of production of widely communicable meaning have been hugely reduced, and, with this, the small and the different has become as viable as the large and the generic. The cultures of the near future will ossify if they fail to leave space for the 'readers' to follow their own tastes, create their own styles and shape their own cultural ends. And the children of Nintendo will simply walk up the wall if the pedagogy served up to them by institutionalised schooling does not engage every fibre of their subjectivity.

Whether it be in the domains of governance, work or cultural life, the command society is giving way to the society of reflexivity. Or so we might say in moments of strategic optimism. In moments of pessimism we might experience these same phenomena as fragmentation, ego-centrism, randomness, ambiguity and anarchy. And when this pessimism turns to fear, we might want to return to earlier, simpler command structures – in nations, workplaces, households and schools. Hence the 'back to basics' push to return to a more didactic education.

The moment one allows greater scope for agency, one finds oneself facing layer upon layer of difference. One discovers actually existing agencies in the massively plural, and not the fabrications and falsifications the command society with its one people, one state nationalism, its regime of mass production and uniform mass consumption, and the pretensions to cultural homogeneity of the old mass media and mass culture. The differences so poignantly manifest today are material (class, locale), corporeal (race, gender, sexuality, dis/ability) and circumstantial (culture, life experience, interest, affinity). These differences are manifest in the profoundly variable dispositions and sensibilities one encounters from person to person.

And to face all these agencies in one classroom! The solution of the command society, didactic education, was one teacher talking at the middle of the class, one textbook telling one narrative one chapter at a time, one test which told of one way of knowing. The result was assimilation to the middle way, or failure. The solution of educational progressivism, authentic education and synthetic epistemology may not be adequate to the challenge, either.

I want to argue that a new epistemology may be required, and I will call this an epistemology of reflexivity. Such an epistemology builds on the insights of both modernism and postmodernism, but extends the capacities for teacher and learner agency that both these epistemologies grapple for, but cut disappointingly short.

In a reflexive epistemology, agency is rebalanced. Relations between experts (teachers) and novices (learners) are reconfigured. More than mere copying (mimesis), more than much the same kinds of people pulling things apart in order to put them back together again in much the same way (synthesis), a reflexive epistemology constructs learning as a dialogue between differences. One difference is between the expert and the novice, and the expert is no longer necessarily or even mostly the teacher: sometimes it is another learner (in relation to whose understandings of the world even the teacher may be a novice), or it may be a person outside of the formal learning institution. These kinds of differences cannot simply be bridged by the expert telling and the novice listening. The other difference is amongst experts and novices: life experiences, ways of seeing, ways of thinking, ways of knowing. In the case of each kind of difference, the key question for a reflexive epistemology is, given their difference, how is the other seeing the way I see them? Or how is the other seeing the way I see them seeing me? This process is necessarily dialogical. The relationship between the teacher-as-expert and the learner-as-novice changes too, in which the peculiar professional expertise of the teacher is their capacity to design and track appropriate learning experiences.

To be more concrete, reflexive epistemology is a process of shunting backwards and forwards between different forms of action, different acts of knowing, measuring their insights against each other. Fragments of each one of these forms of action can be drawn from both the modernist and postmodernist variants of synthetic epistemology. Powerful methodologies for knowledge-making are built into the traditions of synthetic epistemology. However, as I will argue in the last section of this paper, their promise all-too-often falls short of their potential, for their one-sidedness, for their aversion to risk, for their habituated narrowness. For the moment, however, I want to describe what I will call the 'knowledge' process of a transformative education in terms of range of different types of learning activities that teachers might design, and the kinds of things learners might do to learn.

Following are the knowledge processes I would propose for a reflexive epistemology: 'Experiencing the Known' involves reflecting on our own experiences, interests and perspectives. Learners bring their own, invariably diverse knowledge, experiences and interests into the learning situation. These are the subjective and deep truths of lived and voiced experience that postmodernism and poststructuralism emphasises so cogently. And 'Experiencing the New' entails observation of the unfamiliar, immersion

in new situations, reading and recording of new facts and data. Learners encounter new information or experiences, but only within zones of intelligibility and safety, sufficiently close to their own lifeworlds to be half familiar but sufficiently new to require new learning. The modernist methods of empirical observation and experimentation provide valuable ways of reducing the prejudices inherent to one's own perspective when approaching the new.

'Conceptualising by Naming' involves drawing distinctions of similarity and difference, categorising and naming. Here, learners give abstract names to things and develop concepts (Vygotsky 1962). And 'Conceptualising with Theory' means making generalisations and putting the key terms together into theories. This is when learners build mental models, abstract frameworks and transferable disciplinary schemas.

'Analysing Functionally' includes processes of reasoning, drawing inferential and deductive conclusions, establishing functional relations such as between cause and effect and analysing logical connections. Now learners explore causes and effects, develop chains of reasoning and explain patterns. And 'Analysing Critically' involves critical evaluation of your own and other people's perspectives, interests and motives. In this knowledge process, learners interrogate the interests behind a meaning or an action, and their own processes of thinking.

Finally, there are the knowledge processes of application. 'Applying Appropriately' entails the application of knowledge and understandings to the complex diversity of real world situations and testing their validity. By these means, learners do something in predictable and expected ways in a 'real world' situation or a situation that simulates the 'real world'. And 'Applying Creatively' involves making an intervention in the world which is truly innovative and creative and which brings to bear the learner's interests, experiences and aspirations. This is a process of making the world anew with fresh and creative forms of action and perception. Now learners do something that expresses or affects the world in new way, or transfers their previous knowledge into a new setting.

This, if you like, is a list of the kinds of things teachers and learners can do. They are the kinds of things you do, in the premeditated reflective way that distinguishes the pervasively everyday reality of 'learning' from the relative formality, systematicity and focused nature of 'education'.

Pedagogical Moves, Knowledge Processes (Engagement in Learning)

Experiencing • … the known • … the new
Conceptualising • … by naming • … with theory
Analysing • … functionally • … critically
Applying • … appropriately • … creatively

And why bother thinking in these epistemological terms? Using these measures of different kinds of learner activity, our research in the Learning by Design project shows that certain kinds of pedagogy are skewed to certain kinds of epistemology – progressivist or authentic pedagogy to experiential knowledge processes, for instance, and didactic pedagogy to the exposition of disciplinary theories or metanarratives (Kalantzis and Cope 2004, Kalantzis and Cope 2005a). Teachers find themselves unreflectively caught in the rut of one or just a few knowledge processes. It's useful to be able to unpack the range of possible knowledge processes in order to decide and justify what's appropriate for a subject or a learner, to track learner inputs and outputs, and in order to extend the pedagogical repertoires of teachers and the knowledge repertoires of learners (Kalantzis and Cope 2005b).

If it is to be at all relevant, the classroom which develops a reflexive epistemology must allow alternative starting points for learning (what the learner perceives to be worth learning, what engages the particularities of their identity). It must allow for alternative forms of engagement (the varied experiences that need to be brought to bear on the learning, the different conceptual bents of learners, the different analytical perspectives the learner may have on the nature of cause, effect and human interest, and the different settings in which they may apply or enact their knowledge). It must allow for different learning styles (preferences, for instance, for particular emphases in knowledge making and patterns of engagement). It must allow for different modalities in meaning making, embracing alternative expressive potentials for

different learners. In this regard, multimodality is pervasive, or the overlay of text, image, sound, space, touch and gesture in constantly changing ways. And there is a rebalancing of agency in the recognition of active 'design' in the representational process: every meaning draws on resources of the already designed world of representation; each meaning maker designs the world afresh in a way which is always uniquely transformative of found meanings; and then leaves a representational trace to be found by others and transformed once again (Cope and Kalantzis 2000). This active, transformative design process is equally true for readers as writers and viewers as image-constructors, as design applies not just to representation as communication, but representation to oneself as meaning. Finally, a transformative pedagogy with a reflexive epistemology must allow for alternative pathways and comparable destination points in learning (Kalantzis and Cope 2004, Kalantzis and Cope 2005a). By comparability, I do not mean an apolitical complacence in which inequality is rationalised as difference. Rather, the measure of success of transformative pedagogy is equally high performance learning outcomes which can produce comparable social effects for learners in terms of material rewards and socially ascribed status.

Elements of a Science of Education

The questions we face as educators today are big, the challenges profound. Are we, however, well enough equipped to answer the questions and address the challenges? Does our discipline provide us the intellectual wherewithal to face changes of these proportions? My answer is that it could, but only if we conceive education as a science as rigorous in its methods and as ambitious in its scope as any science.

I will use the word 'science' in quite a pointed way, in a context where the practices of research and theorisation of education have been narrowed in the name of an empiricist and instrumental 'science' to the same extent that progressivism has been narrowed by the 'back to basics' trend in schools. As the US leads the world in so many areas of cultural and political life by dint of sheer imperial force, it is hardly surprising that George Bush's 'No Child Left Behind Act' has had a profound impact on the educational world. One piece of its paraphernalia is a definite view of what constitutes valid properly 'scientific' educational research. This idea is represented in its clearest and most influential form in the report of the US National Research Council, *Scientific Research in Education* (Shavelson and Towne 2002), a product of the No Child Left Behind agenda. The drift of the report is to assert that only narrowly focused empirical research and controlled experimentation – x initiative leads to y measurable results – can be science. This it calls 'evidence-based research', which in its turn will produce teaching based on research-proven techniques 'that work'. The US Federal Department of Education is explicit about its agenda here: 'Unlike

medicine, agriculture and industrial production, the field of education operates largely on the basis of ideology and consensus. As such, it is subject to fads and is incapable of the cumulative progress that follows from the application of the scientific method and from the systematic collection and use of objective information ... We will change education to make it into an evidence-based field' (Quoted in Erickson and Gutierrez 2002, p. 22). Although less narrow in their intentions and sectarian in their politics, clearly this also is the kind of research which Australian Governments would now want to favour and for the same kinds of reasons.

I want to question the pretence to science that this educational movement represents. In its more sophisticated moments, it selectively draws from the modernist tradition of synthetic epistemology that I described earlier in this paper – it will measure various classroom inputs in relation to learner test outputs in an empiricist and instrumentalist kind of way without critically examining the broader frame of reference of the classroom in a changing society and the relevance of the outputs. For its methodical procedures, it calls itself science. But if it turns out to be a science which is attempting minor re-engineering of a pedagogical system which might be in need of a more thoroughgoing overhaul?

One possible rejoinder is that education can never be like a science – the model of controlled experimentation offered by laboratory natural science is unachievable in education and possibly unethical (Popkewitz 2004, pp. 67-68). We're dealing with human beings with interests, desires, identities and agency, not just brains and clinically isolatable pedagogical moves.

Another rejoinder is that the natural and technological sciences are themselves more 'ideological' – more subject to contestation around axes of human interest – than the narrow understanding of science proffered by the proponents of 'evidence-based' research seem to be able to comprehend. Whether it be bioethics, or the politics of climate research, or the debates around Darwinism and Intelligent Design, or the semantics of computer systems, questions of politics and ideology are bound closely with the ostensible evidence. There can no longer be any faux empiricism, not even in the natural and technological sciences.

Nor can there be narrowly unambitious apolitical horizons. Maybe there's something fundamentally wanting in the institutional inheritance that is today's schools? Maybe the 'back to basics' movement is flawed to its core?

Meanwhile medical scientists are trying to tackle the seemingly impossible – MS, and Alzheimer's and cancer. None of them seem to know the answer, but their ambitions are high and their risks great as they try to come up with something fundamentally

new, radically innovative, shockingly transformative. Any such ambitions would be way beyond the bounds of a narrowly 'evidence-based' view of science.

What, then, is a science? Some of the studies of the social comfortably and habitually call themselves 'sciences', but others do not. In the case of education, there's a good deal of discomfort about the applicability of the term, particularly given they way it is used by the likes of George Bush's Department of Education.

The English word 'science' derives from the Latin 'sciens', or knowing. The meaning if science has been narrowed in English to mean empirical method applied to the natural or human world without any potentially prejudicial interest. Return to the expansiveness of this root, and the study of human learning must have claim to word equal to the other social sciences and the natural sciences.

The root, however, is perhaps too expansive to describe the contemporary practices of science. 'Science' implies an intensity of focus and a concentration of intellectual energies greater than that of ordinary, everyday, commonsense or lay 'knowing'. It relies on the ritualistic rigour and accumulated wisdoms of disciplinary practices.

Wherever science is to be found, it is more than casual knowing. It involves a kind of systematicity that does not exist in casual experience. Husserl draws the distinction between the 'lifeworld' and what is 'transcendental' about science (Cope and Kalantzis 2000, Husserl 1970). The 'lifeworld' is everyday lived experience. It is a place where one's everyday understandings and actions seem to work instinctively – not too much conscious or reflective thought is required. The 'transcendental' of science is a place above and beyond the commonsense assumptions of the lifeworld. In counterdistinction to the relative unconscious, unreflexive knowledge in and of the lifeworld, science sets out to comprehend and create designs which are beyond and beneath the everyday, amorphous pragmatics of the lifeworld. Science, by contrast, is focused, systematic, premeditated, reflective, purposeful, disciplined and open to scrutiny by a community of experts.

What is a discipline? Disciplines are fields of deep and detailed content knowledge, communities of professional practice, forms of discourse (of fine and precise semantic distinction and technicality), areas of work (types of organisation or divisions within organisations such as academic departments or research organisations), domains of publication and public communication, common experiences of learning through induction as apprentices into the community, methods of reading and analysing the world, epistemic frames or ways of thinking, and even ways of acting and types of person. 'Discipline' delineates the boundaries of intellectual community, the distinctive practices and methodologies of particular areas of rigorous and

concentrated intellectual effort, and the varying frames of reference used to interpret the world. Medicine is the science of the human physiology; archaeology is the science of human physical traces; history is the science of the human and natural past; psychology is the science of mind; education is the science of learning.

These are some of the out-of-the-ordinary constituents of method that might justify use of the word 'science', not only in the social sciences but in the natural, physical, mathematical and applied sciences as well:

Science has a basis in **lived experience.** This experience may be based on direct personal intuition of the already-known, on interests integral to the lifeworld, on the richness of life fully lived. This kind of knowledge process might involve listening to voice, feeling the sensual, recognising the embodied, framing the performative, accounting for the complex layers of the lifeworld, explaining the politics of identity or understanding the intuitive. This is a focus of postmodernism or poststructuralism, and its weaknesses are excessive subjectivism, the agnostic relativism of lived experience and distancing, identity-driven voice (Blackburn 2005).

Science also has an **empirical** basis, or the experience of moving into new and potentially strange terrains, deploying the processes of methodical observation and systematic experimentation. This kind of knowledge process might involve systematising the modes of perception, measuring, quantifying, describing, testing. Taken to one-sided excess, this creates narrow empiricism characteristic of the 'No Child Left Behind' vision for educational science (Erikson and Gutierrez 2002).

Science also has a **categorical** frame of reference based on higher levels of semantic precision and regularity than acceptable in everyday discourse. Using this knowledge process, we may make knowledge by grouping like and unlike on the basis of underlying attributes; we may abstract, classify and build taxonomies (Vygotsky 1962). The danger in such categorical work is rigidity and overly simplified either/or dualism.

Science builds **theories** which model the world and build explanatory paradigms. The danger of excessive emphasis on theory is unreflective acceptance of received theories and poorly grounded epistemological idealism.

Science, moreover, develops frames of reasoning and **explanation**: logic, inference, prediction, hypothesis, induction, deduction. The potential dangers are in developing systems of formal reasoning disengaged from human and natural consequences; technical control without adequate ethical reflection; the elision of means and ends; and narrow functionalism, instrumentalism or techno-rationalism.

Strong science also analyses the world through the always cautious eye of **critique**, interrogating interests, motives and ethics that may motivate knowledge claims – an ever-vigilant process of metacognitive reflection. However, the danger here is disengaged criticism and supercilious inaction without design responsibility, political confrontation without constructive engagement, academic fractiousness without apparent need for compromise.

Science is application-oriented. It may be **pragmatic**, designing and implementing practical solutions within larger frames of reference and achieving technical and instrumental outcomes. What purpose knowing, after all, other than to have an effect on the world, directly or indirectly? This kind of knowledge process involves practical forms of understanding and knowledge application in a predictable way in an appropriate setting. Its dangers may be narrow instrumentalism and uncritical, technicist pragmatism.

At its best, science is inventive and **innovative** – redesigning paradigms, and transforming social being or even the conditions of the natural world. This kind of knowledge process may be manifest as creativity, innovation, knowledge transfer into a distant setting, risk taking, self-enablement, and the attempt to translate emancipatory and utopian agendas into practical realities. Its dangers are voluntaristic overconfidence that leads to a naive lack of pragmatism and a misreading of practical circumstances that produces failure.

Pedagogical Moves, Knowledge Processes (Engagement in Learning)	**Scientific Moves, Acts of Knowing (System and Method)**
Experiencing • … the known • … the new	 1. The Lived 2. The Empirical
Conceptualising • … by naming • … with theory	 3. Categories 4. Paradigms
Analysing • … functionally • … critically	 5. Explanation 6. Critique
Applying • … appropriately • … creatively	 7. Pragmatics 8. Innovation

Science can be any or all of these things, for better and at times for worse. Some disciplines may prioritise one or more of these acts of knowing, these scientific moves, over others, and this may be the source of their strength as well as their potential weakness. In any event, these are the kinds of things we do in order to know in the out-of-the-ordinary way of science.

Several imperatives emerge for a science of education. First, science is a form of action. It is not simply a process of thinking, a matter of cognitive understanding. Science consists of the out-of-the-ordinary things we do to know, and to know with an out-of-the-ordinary ability to see the world and know the world. These things are performatives – acts of intervention as well as acts of representation, deeds as well as thoughts, types of action as well as forms of contemplation.

Second, holism will mostly create knowledge that is more powerful than narrower reliance on just one or a few knowledge processes. So, the careful empiricism of observation or experimentation is all the more powerful if measured against the critical measures of personal experience and a cautious eye for interests and agendas. The application-orientation of action research will be all the more powerful if it is founded on conceptual clarity and linked with deep theoretical understandings. So, stronger science is more likely to use a balance of alternative scientific moves or acts of knowing, or at least be able to justify a narrower epistemic focus.

Third, if education in the last analysis is the science of how humans come to know, this is a question of such breadth and profundity that it can only be addressed in a truly interdisciplinary way. It means that the content or the subject matter of the discipline needs to be grounded in the theoretically fraught philosophical domain of epistemology. And as we are dealing with humans in their deep diversity, we need an holistic understanding of the sociology and anthropology of difference in inequality. We also have to acquaint ourselves with territories considered to be part of the natural sciences, such as the latest brain research – not the doubtful empiricist inferences of certain strains of cognitive science or the populist simplicities of the left and the right brain, but difficult recent neurobiology which seeks to find the neurological correlates of consciousness (Koch 2004). We need to consider once again the stuff of human nature, where physical anthropology meets palaeontology meets the study of primate evolution (Donald 2001). We need to study the natural history of this strangely symbolic species (Deacon 1997) and the historical linguistics of the shift from oracy to literacy as modes of representation of the world (Goody 1977, Ong 1982). And we must take a globalist, pan-human view, equally concerned to understand Indigenous, Buddhist, Confucian and Islamic ways of knowing as those of classical Europe and the Western Enlightenment. This is an intellectually ambitious agenda.

Education's agenda is also practically ambitious. It is learner-transformative (the enablement of productive workers, participating citizens and fulfilled person). And it is world-transformative as we interrogate the human nature of learning, and its role in imagining and enacting new ways of being human and living socially – shaping our identities, framing or ways of belonging, using technologies, representing meanings in new ways and through new media, building participatory spaces, collaborating to build and rebuild the world. These are enormous practical challenges. The science of education is a domain of social imagination, invention and action. It's as big, as ambitious and as determinedly practical, as medical science's fight against seemingly intractable diseases.

Education for the Future: Areas for Investigation
Aspect 1: The Social Significance of Education as a Science Life-long and life-wide knowledge as a key factor of production, an economic and thus social fundamental.
Aspect 2: The Institutional Locations of Learning To teach and recognise (accredit) learning outside and beyond the traditional boundaries of discipline content, programs and classrooms.
Aspect 3: The Tools of Learning For learning at home, work and community integrated learning, learning with learners who are not in the same classroom.
Aspect 4: The Locus of Capacity Thinking, resilient individuals who connect with the sophisticated sociability of collaborative learning, group work, emotional empathy, an holistic understanding of the global as well as local consequences of one's actions.
Aspect 5: The Balance of Agency Learners are as much makers of their own knowledge as the receivers of it, teachers are facilitators of learning as much as they are fonts of knowledge.
Aspect 6: The Significance of Difference Actively recognising and engaging productively with a panoply of human differences that are increasingly more significant.
Aspect 7: The Relation of the New to the Old Given diversity, moments of old learning are a strategic and integral part of the world of the New Learning.
Aspect 8: The Professional Role of the Teacher The new teacher is an autonomous, responsible manager of student learning. They are also corporate players, collaborators and members of a self-regulating profession. The new teacher is a learner – a designer of learning environments, an evaluator of their effectiveness, a researcher, a social scientist and an intellectual in their own right.

To return now to where I began this paper, what do we make of that Australian political moment thirty years ago? Notwithstanding the reflected glow of the Whitlam era amongst those nostalgic for its progressivism, there can be no return. Education can, indeed, be a modernising force and one which addresses the twin demands of economic progress and social inclusion. However, neither the progressivism of the third quarter of the twentieth century with its humanistic view of the discipline of education, nor the anachronistic 'back to basics' of our more recent times with its empiricist and ostensibly apolitical view of educational 'science', provide adequate tools for the challenges we educators face today, let alone tomorrow.

Education is, in fact, a science, but that science has to be defined more rigorously than those who disingenuously believe it can and should be de-politicised, stripped of ideology and bigger-picture transformative agendas.

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