CAMBRIDGE ASSESSMENT

Could do better:

Using international comparisons to refine the National Curriculum in England

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Foreword by the Secretary of State for Education

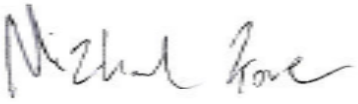
This fascinating and insightful paper offers a concise analysis of some of the problems with our current National Curriculum and helps explain why so many other nations are outpacing us in educational performance.

The debate about our National Curriculum now has to be seen in an international context. The best-performing education nations deliberately set out to compare themselves against international benchmarks – learning from each other and constantly asking what is required to help all children do better. Hong Kong and Singapore have sought to maintain their pre-eminence by reviewing their national curricula while Australia and US states are also looking to see how they can modernise their curriculum offers.

While other countries have developed coherent national curricula that allow for the steady accumulation of knowledge and conceptual understanding, our National Curriculum has, sadly, lost much of its initial focus. As Tim Oates explains, “in all high-performing systems, the fundamentals of subjects are strongly emphasised, have substantial time allocation, and are the focus of considerable attention in learning programmes” – yet in England we have been moving away from this goal.

In recent years, there has been a loss of stability and purpose with new subjects and topics added – more often in response to pressure groups than for sound pedagogical reasons. The most recent overhaul of the National Curriculum in 2007 was a serious backward step as concepts were replaced with vague generic statements of little value. Previous reviews of the curriculum sought to over-specify classroom practice. As Tim Oates says, the decision to teach in a particular way may not be appropriate for all schools or teachers, but what is crucial is first identifying the crucial concepts and ideas that each year group should learn.

Shortly, my Department will launch its own review of the National Curriculum and the remit will explicitly, for the first time, require benchmarking against the most successful school systems. This – as Tim makes clear – has to be done with great care to avoid learning the wrong lessons from countries with very different cultures. But it is essential if we are to keep pace with the world’s best. This paper is the perfect introduction to the challenge we face.



Rt Hon Michael Gove MP

Overview of this paper

This paper argues that although the National Curriculum for England has been subjected to a protracted process of revision, the latest round of revisions failed adequately to draw from emerging analysis of high-performing systems around the globe. By taking a wrong turn in revision strategy, accumulated problems were not confronted and new problems were introduced. The paper outlines both the strengths and the weaknesses of current arrangements in England. It argues that a National Curriculum is extremely important, and that stability in arrangements is of considerable advantage to all. It draws from transnational analysis some key concepts – including 'curriculum coherence' and 'curriculum control' – to understand the operation of other nation systems and establish what we can learn from them, and identify what we can promote in our own system.

The analysis presented in the paper shows how misconceptions about the performance of other nations' curriculum arrangements and educational performance have built up and, by dismantling these misconceptions, we can better understand the means by which arrangements in England can be enhanced. It argues against crude 'policy borrowing' from other nations and for sophisticated management of the 'control factors' at our disposal, in our own setting.

While the paper contains technical digressions into assessment, into the specifics of other nations and the history of the National Curriculum in England, the arguments combine to reach a very clear conclusion: that refinement in the National Curriculum is necessary, can be informed by transnational comparison of high-performing systems, and that once the National Curriculum assumes a form more consistent with high-performing systems, stability in arrangements is highly desirable.

Reviewing the National Curriculum in England – breaking the tendency towards introspection

Established in 1988, the National Curriculum constituted a fundamental reform of education arrangements in England, Wales and Northern Ireland, taking the system away from the acute variations in curriculum content which were contributing to variation in the quality of educational provision (Gray J et al 1999; Tymms P & Merrell 2007). While the National Curriculum was a clear watershed, in the wake of the Great Debate launched by Jim Callaghan in 1976 (Black PJ 1994), a more pronounced structural drive for a 'core' of curriculum content was already manifest in the system in the decade prior to the introduction of the National Curriculum – and the impetus behind that drive was not exclusively associated with a specific Government (Salter B & Tapper T 1981; Johnson M et al 2007). Education interests were themselves beginning to recognise the need for a greater alignment and consistency. Critically, local and national inspection services initiated the process of identification of essential elements of the curriculum (Shaw K 1993; Chitty C 2002), researchers and commentators were exploring concepts of 'core curriculum' (Lawton D 1980) and the 'circulars' from the then Department of Education and Science (DES) contributed to the process of encouraging alignment on curriculum elements (Graham D & Tytler D 1993; Simon B 1993). The National Curriculum was radical – and the development challenge associated with the curriculum content and assessment arrangements enormous - but it was not inconsistent with underlying trends in the system.

The deep nature of the change effected by the development and implementation of the National Curriculum inevitably caused a highly introspective process of review and reflection. Rather than keeping a critical eye on the detail of international developments in curriculum, eyes looked inwards, towards the myriad changes in domestic arrangements necessary to implement the new curriculum effectively and to

embed the new assessment and governance arrangements accompanying it. This introspection was perpetuated by rapid recognition of the need to review the National Curriculum in the face of obvious curriculum overload – it was simply too big (Dearing R 1994; Lawton D 2008; Conway D 2010). It also interacted badly with GCSE – itself a fundamental reform of public examinations (Graham D & Tytler D 1993; Daugherty R 1995; Gipps C & Stobart G undated). Following the wholesale Dearing Review of 1995, the review process – of both the curriculum content and the assessment arrangements - has remained 'short cycle', with a renewal cycle typically shorter than ten years (House of Commons Children, Schools and Families Committee 2009). Adjustments have occurred not only in the 'core' material of the curriculum (eg the removal of the cross-curriculum themes and skills; the move from ten levels to eight) but in the repeated addition of new material (eg functional skills, Citizenship, sexual health as a theme in biology), changes in assessment (eg the incorporation of mental mathematics in testing), and in supplementary materials (eg the schemes of work (DES 2010). Rendering the situation more complex has been the uncertainty surrounding that which is statutory and that which is not – exemplified by the ambiguity over the Literacy and Numeracy strategies and, more recently, Personal, Learning and Thinking Skills, and Assessing Pupil Progress – all contrasting in form, purpose and scope. The frequency and extent of change is itself problematic; the need for teachers to revise materials, pedagogy, administration, and so on removes capacity from the system (Lebus S 2010), as arrangements go through adaptation to new requirements. Stability – holding things as they are – should be treated as a policy response of equal merit to active change (Leney T & Coles M 2001), since public goods can be threatened not only by failing to act but also by acting without due cause or reason (Sebba J 2004). However, it would be prudent to adopt a policy response where National Curriculum only assumes greater stability once it has assumed the right form – this paper traces problems in the current formulation of the National Curriculum, some of which commit it to greater instability than is necessary.

Cutting into the national introspection precipitated by this process, interest in developments outside these shores has been excited by the emergence of new and revised national curricula in other jurisdictions – Sweden (1994), Massachusetts (1997), Singapore (2000) - with New Zealand (1991) providing a particular focus (Priestly M & Highams J undated; Mcculloch G 2005). However, a far more sophisticated form of review has emerged with the maturation of the large international surveys – TIMSS, PISA and PIRLS (see Annex 1, with Annex 2 giving the top line rank-ordering of key nations in PISA). Analysts such as Schmidt and Prawat (Schmidt W & Prawat R 2006), Stigler and Stevenson (Stigler JW & Stevenson HW 2006), Rudduck (Rudduck J, Chaplain R & Wallace G (eds.) 1996), and Askew and Hodgen (Askew M & Hodgen J et al 2010) have now developed deeper understanding of the features of nations' curriculum arrangements which are associated with high performance. Indeed, interest has been rising in the processes by which nations review their curricula and the rationale behind change (Sargent C, Byrne A, O'Donnell S & White E 2010). Moving beyond the notion that the mere existence of a national curriculum is a precondition of high performance, they have identified key characteristics of those systems which have attained high performance and, critically, have improved performance over time (Schmidt op cit; OECD 2010; Ruddock G et al 2004) (annex 3 shows levels of expenditure – high expenditure is not necessarily associated with high performance). This paper explores the way in which these insights can be used for refining arrangements in England.

The body of knowledge from sound transnational analysis is of vital importance. This paper argues that the most recent reviews of the National Curriculum in England have failed to harness the insights emerging from high quality transnational comparisons. The introspection associated with the review processes is entirely

consistent with tendencies in the educational reform process in England. Archer's and Green's trenchant analyses of the character of national reform in different countries (Archer M 1979; Green A 1990; Green A 1997) highlight the extent to which English processes tend towards satisfying the conflicting demands of competing societal and lobby groups rather than developing more radical policy solutions, which have greater potential to confront chronic structural problems.

This suggests that we should appraise carefully both international and national research in order to drive an evidence-based review of the National Curriculum – and that such a review should effect change only where justified, in order to avoid unnecessary disruption to the education system. This paper suggests how the insights from both internal critique and transnational analysis can be used to inform this process.

The National Curriculum: benefits and ills

Domestic research on the benefits of the National Curriculum and its associated assessment emphasises that:

1
The concept of 'entitlement' has been highly effective in raising attainment (Chitty C 2004; Colwill I & Peacey N 2003)

2
Structure progression in the National Curriculum has reduced inappropriate repetition of content as children progress through education (Chitty C op cit; Evangelou et al 2008)

3
The rate and pattern of pupil progression has been enhanced (Chitty C op cit; Tymms P 2004; Whetton et al 2007)

4
Balanced coverage has emerged in the primary phase, particularly in respect of science (Harlen W 2008)

5
The common structure has supported more effective pupil transfer, which previously affected vulnerable groups of children in particular (Dobson J & Pooley CE 2004: Strand S 2002)

6
The curriculum entitlement has enhanced performance of girls in maths and science (Machin S & McNally S 2006)

7
The structured approach to content and assessment has led to identification of issues such as the Key Stage 3 dip (Powell R, Smith R, Jones G, Reakes A 2006; Doddington C, Flutter J & Rudduck J 1999)

8
The National Curriculum has led to higher expectations of young people (Barber M 2002; Hopkins D 2001; Tabberer R 1997)

However, problems have accumulated in respect of:

1
Acute overload, with resulting pressure on teachers to move with undue pace through material and encouraging a 'tick list' approach to teaching (Black P & Wiliam D 1999; Alexander R (ed) 2010; Dearing R 1994; House of Commons Children, Schools and Families Committee 2008)

2
All groups clamouring to ensure that subject content which reflects their interest is included in the 'core' content of the National Curriculum – leading to a lack of clarity as to what should legitimately be included, or not included (Rawling E 2001)

3
Overbearing assessment with adverse impact on teaching and learning (Black & Wiliam op cit; Pollard A, Broadfoot P, Croll P, Osborn M & Abbott D 1994; ARG & TLRP 2009; Mansell W 2007), with specific problems emerging in relation to narrow drilling for tests (Pollard A, Broadfoot P, Croll P, Osborn M & Abbott D op cit; ARG & TLRP op cit; TES 2005) and a failure of the assessment to provide policymakers with robust information on national standards (Oates T 2005; Statistics Commission 2005; Tymms P 2007; Massey A, Green S, Dexter T & Hamnett L 2003).

While the problems are serious and require a policy response, revision of the National Curriculum should not be driven by partial consideration of the problems, and should be based on sophisticated understanding of the functions which a National Curriculum can support. Greater problems will most likely be created by expecting too much of a National Curriculum, or revising it in the wrong way. This paper argues that two key concepts drawn from transnational analysis – 'curriculum control' and 'curriculum coherence' – are vital for understanding how other nations have developed and managed national curricula to good effect, and both can be used for developing more effective arrangements in England. The weight of evidence from transnational comparison is that a certain degree of curriculum control is necessary (that this need not be associated with 'top down' control or control exercised exclusively by the State) and that this control should be directed towards attaining 'curriculum coherence'. The analysis in this paper shows how curriculum control is necessary, but can be enacted in very different ways – some systems emphasise high levels of teacher qualification, others emphasise tightly controlled curriculum materials, and so on. An analysis of 'control factors' appears below. Policy utilising a different emphasis across the different control factors is evident in different jurisdictions – all to achieve the same high performance. The term 'coherence' does not carry the meaning typically associated with a 'broad and balanced curriculum' but is a highly precise technical term: a national curriculum should have content arranged in an order which is securely based in evidence associated with age-related progression, and all elements of the system (content, assessment, pedagogy, teacher training, teaching materials, incentives and drivers etc) should all line up and act in a concerted way to deliver public goods (Schmidt & Prawat op cit).

Accumulated problems and the 2007 revision of the National Curriculum

The late Ron Dearing was candid about what he had achieved in the 1995 revision of the National Curriculum. In reducing the number of levels from 10 to 8, and resolving

the problematic relation between Key Stage 4 and GCSE (Gipps C & Stobart G undated), he successfully relieved problems of overload and confusion - but he was quite clear that it was a 'temporary fix' (Golby M 1994). The subsequent 1999 version of the National Curriculum was welcomed, and represented a further clarification of content. It did not, however, address all the residual problems of overload, nor the accumulating problems in assessment (Mansell W 2007; ARG & TLRP 2009).

The revisions drafted by QCDA in 2007 (then the QCA), represented a radical reduction in content and a drive towards highly generic content statements. Whilst further reduction may have been desirable, the last round of QCDA-led changes depart from the legislative underpinnings of the National Curriculum, remain informed by a nationally-introspective approach and appear under-informed by lessons from transnational comparisons – as such they do not accord with 'principled re-design' (Mislevy R, Steinberg L, Almond RG, Haertel GD, & Penuel R 2003). As a result, the 2007 changes were a step backwards from the 1999 specifications. The analysis in this paper suggests that further change is indeed required, but that international and national research evidence should take a prime role in driving that change.

The departure from the stated aims – and legal base - of the National Curriculum is extremely serious. The National Curriculum is intended to establish an entitlement – all children should have access to learning in key areas. The 2008 statement of aims for the National Curriculum was both consistent with the original legislation establishing the National Curriculum and sharply at odds with the redrafting undertaken at the same time. The aims and purposes stated that:

Aim 1 The school curriculum should aim to provide opportunities for all pupils to learn and to achieve
Aim 2 The school curriculum should aim to promote pupils' spiritual, moral, social, cultural development and prepare pupils for the opportunities, responsibilities and experiences of life

The purpose of a statutory core to the curriculum is:

Purpose 1: To establish an entitlement
Purpose 2: To establish standards
Purpose 3: To promote continuity and coherence
Purpose 4: To promote public understanding

(QCDA 2010)

On entitlement: the highly generic statements resulting from the 2007 revisions opened up substantial ambiguity in respect of the content of that entitlement – with the potential to both lower overall standards and open up differences in the quality of educational provision in different schools (TES 2009).

On standards: developing fair and accurate assessment relies on clarity in the statement of that which is to be assessed (APA 1999; Cambridge Assessment 2009) – this was not provided by the highly generic statement of the revised National Curriculum. This is dealt with later in this paper.

On continuity and coherence: while continuity between key stages has been addressed in the various reviews of the National Curriculum, transnational analysis shows that two aspects of the National Curriculum remain problematic. Firstly, the placing of key material in subjects such as mathematics – for example algebra – is

out of synch with that of other leading nations. Secondly, the concept of 'coherence' has not been defined with precision in the reviews of the National Curriculum. Nor has it been used to manage the relationship between National Curriculum aims and the effects of National Assessment arrangements – resulting in narrow drilling for tests at Key Stage 2 inconsistent with the purpose of the curriculum. However, transnational analysis gives us a powerful, carefully-defined concept of 'coherence' which can be used both to refine the sequencing of the material in the National Curriculum and the interaction of curriculum, assessment, pedagogy and so on. This definition of 'coherence' differs from, and is more precise than, those commonly used (for example see Sargent C, Byrne A, O'Donnell S & White E op cit). This is discussed in detail in a later section.

On public understanding: 'Levels' remain the main reporting mechanism in respect of National Curriculum. Yet genuine understanding of the way in which a child can attain a level remains widely misunderstood. Recognised as a significant problem by those managing the development of National Assessment – and highlighted by the troubled development of the now-abandoned Single Level Tests (Whetton C 2008; TES 2010) – the 2007 revisions failed to tackle this structural issue. The main reporting mechanism from the National Curriculum does not contribute to genuine public understanding. Again, this is discussed later in the paper.

The 2007 revisions were accompanied by explanatory statements which emphasised three ideas: 'the importance of removing subject boundaries'; 'the need to constantly keep the National Curriculum up to date'; and 'the necessity for a motivating National Curriculum' (BBC 2007; QCA undated). These strong commitments embody some highly problematic assumptions.

Firstly, on 'removing subject boundaries', the statements began strongly to emphasise very specific approaches to teaching – a degree of specification at odds with both the letter and spirit of legislation. The legal framework associated with the National Curriculum is clearly oriented towards severely restricting the extent to which the National Curriculum should prescribe the exact form of teaching (Graham D & Tytler D op cit; Johnson M et al op cit). Whilst adopting cross-curriculum approaches may prove helpful for some schools in some circumstances, a highly doctrinaire view of teaching delivery was beginning to be associated with the National Curriculum.

Secondly, the need for 'constant updating' is only present if the National Curriculum moves away from listing the essential elements of subjects. Teachers, their associations and other commentators emphasise the importance of ensuring due stability in the content requirements of the National Curriculum and its assessment (Johnson M et al op cit; TES 2008; Children, Schools and Families Committee 2010). Effectiveness in the system is reduced greatly when teachers and schools need constantly to change teaching approaches and materials unnecessarily (Woods P 1996; Burgess H 2008). The principal motor for driving revision of subjects in the National Curriculum should thus be change in the structure and content of knowledge (Lawton D 1980; Hirst P 1974; Hirst P 1975; Jenkins E 2007). If highly contextualised content is inserted into the National Curriculum – specific issues of contemporary relevance – then the pace of change is likely to be extremely fast, and the need for revision constant. If, however, the National Curriculum focuses on the essential elements of subjects, then the pace of change is likely to be considerably slower – yielding considerable advantage for teachers, and enhancing the supply of well-grounded textbooks and support materials.

Thirdly, the notion of a 'motivating' National Curriculum is superficially attractive, yet ultimately entirely misleading. Securing the motivation of pupils is essential– it leads to maximal learning and thus to both individual and societal benefit (McKenzie P & Wurzburg G 1997; Smith J & Spurling A 2001; ARG 2002). But securing the motivation of individuals and groups is a subtle and sensitive process, requiring great skill on the part of teachers and schools (ARG 2002 op cit; Black P, Harrison C, Lee C, Marshall B & Wiliam D 2003; Gupta A 2007). A national curriculum should include that which is essential for participation in a modern, democratic society – the fundamentals necessary for progression. Such content is unlikely to be obviously motivating or demotivating. It is a conceptual confusion to call 'ratio' or 'photosynthesis' motivating or demotivating. It is for teachers and schools to construct programmes of learning which will be motivating for ***their learners***– it is teachers who understand the specific keys to unlocking the motivation of their learners (Black P, Harrison C, Lee C, Marshall B & Wiliam D op cit) in respect of essential bodies of knowledge. This suggests that there is a powerful distinction between ***content*** and ***context***. In areas such as maths and science, the National Curriculum should focus on being a clear statement of ***content*** – a listing of concepts, principles, fundamental operations, and key knowledge. In line with research on high quality pedagogy (Stigler & Stevenson 1999), ***contextualisation*** of this content should be left to teachers and schools, since the careful and subtle contextualisation of fundamental concepts is the key to deep learning and to unlocking the motivation of individual learners, and of different groups of learners (Stigler & Stevenson op cit; Black P, Harrison C, Lee C, Marshall B & Wiliam D op cit). Promoting such a focus would have the effect both of reducing unnecessary bulk in the National Curriculum and of reducing the pressure for repeated change.

The reduction in bulk is important; there is strong evidence of teachers moving with undue, enforced pace through an overladen curriculum (Children, Schools and Families Committee 2008; Children, Schools and Families Committee 2009). Deep learning must be a principal goal of the National Curriculum (Black P & WIliam D op cit), with learners able to retain and transfer learning. For this to occur, adequate time on topics must be possible. This is not an argument against adequate pace and progression. It is a recognition that an overblown curriculum specification can give rise to undue pace, and that undue pace erodes deep learning, promotes a 'tick box' approach to learning amongst both teachers and learners (Black P & Wiliam D 1998; Children, Schools and Families Committee 2009), and compromises genuine accumulation of learning (characterised by retention and redeployment of knowledge and skills). Reduction in bulk also would yield benefit in respect of assessment, and it is to this that the paper now turns.

The implications of a poor relationship between curriculum content and assessment

The interaction of curriculum and assessment is an important matter. Assessment can drive learning in a beneficial manner (Cook J undated; Gipps C 1994; Shepard L 2000; Hempenstall K 2009) but poorly structured learning objectives can compromise the design and operation of assessment, in turn impacting adversely on learning:

> A 'bloated' specification can promote overassessment - leading either to tests which are excessively long, or are short but suffer from 'inadequate domain sampling' – it is difficult to have reasonable expectation of what is in the tests, and they will be an inadequate measure of what learners may have achieved. The first version of the National Curriculum manifested a degree of overload with which successive subsequent reviews had to grapple.

An ‘over-generic’ specification will tend towards promoting considerable diversity in learning programmes and thus in what learners will have achieved – it is then difficult to develop fair tests; the assessment domain has enlarged, it is difficult to ensure that the tests match the actual attainments of all learners – validity is compromised. The 2007 version pushed too far towards generic statements, offering little guidance to those developing tests. Teachers have little choice under such circumstances to do anything other than relate learning to past test papers rather than the objectives of the curriculum, since the curriculum offers inadequate guidance as to what will appear in the tests.

If the specification places content in an inappropriate framework of progression up through the phases of learning in subjects, the assessments are likely to possess peculiar patterns of attainment (facility) – that is, there will be odd patterns of failure and success at specific ages, thus eroding the face validity of the assessments. Who does well and who does badly may be subject to peculiar reversals at different phases.

If the specifications contain irrelevant content, there will be erosion of face validity of assessments and qualifications, leading to a loss of confidence in national assessment and public qualifications.

If the specifications do not identify those elements of ‘deep learning’ essential to understanding in subjects (and focus only on a narrow range of ‘surface elements of subjects) and do not identify those elements essential to progression (eg from the primary phase to the secondary phase) then tests are likely to be narrow in scope, and lead to narrow ‘teaching to the test’.

Whilst the 1999 National Curriculum enabled test developers to find topics such as ‘photosynthesis’ in which to write well-grounded tests, the 2007 revisions resulted in such vague statements of content that valid testing - fair and clear to learners, teachers and parents – was severely compromised. In testing, a clear notion of ‘the construct’ – what it is that is actually being tested – is critical (Wood R 1993; Cambridge Assessment op cit; APA op cit). Even before the 2007 revisions, the problem with levels awarded to learners being based on gaining marks across material dispersed across different levels meant that test designers were already basing each year’s tests more on the form and coverage of previous years’ tests than on secure constructs relating clearly to the National Curriculum content. A coherent link between the curriculum and the testing thus was problematic. With the ‘wash back’ from the tests already leading to protracted, narrow drilling for tests at the end of Key Stage 2 (Mansell W op cit), there are grounds for ensuring that any review of the National Curriculum has clear and beneficial effects on the precise form and operation of national assessment.

The confusion between concepts and context

It was not a trivial problem that, prior to the National Curriculum in England, pupils could be involved in studying topics such as ‘The Vikings’ four times in the course of 5-14 education (Graham D & Tytler D op cit; Johnson M et al op cit). The National Curriculum sought, quite rightly, to prevent this. However, ‘contexts’ have become dominant in revisions of the National Curriculum, displacing vital knowledge and concepts. Contexts – such as the environment, specific industrial processes, atomic power – can provide motivation to study and show the relevance of conceptual material. Used carefully, they can be the ***curriculum vehicle*** for concept-based and knowledge-based National Curriculum content. However, unless managed carefully in learning programmes, contextual material can be systematically misleading and

distracting, preventing the effective acquisition of underlying concepts. Black's and Wiliam's work on Assessment for Learning highlights the acute dangers in attending only to superficial aspects of pupils' work rather than underlying conceptual development. The work on iteration of theory and practice in pedagogy in high performing Asian nations (Stigler and Stevenson op cit) suggests that different contexts constantly should be woven into lessons, and the contexts adapted to each child, in order to find the particular key to opening their understanding of a crucial concept. Spending more time on larger 'blocks' of cognate material allowed deeper, more secure learning to be achieved. In addition, teachers in these Asian settings are free to use different contexts as they see fit, in order to unlock understanding (Stigler and Stevenson op cit; Stigler J & Hiebert J 1999). The central specification of contexts through a national curriculum undermines this essential flexibility. The National Curriculum should be concept-led and knowledge-led, not context-led.

A focus on concepts, principles, fundamental operations and key knowledge
There is strong empirical and theoretical evidence for a very strong focus on concepts and principles. Transnational comparisons make clear that high-performing systems indeed focus on concepts and principles. 'Concepts and principles' include 'conservation of mass', 'elasticity', 'metaphor'; within 'concepts' we can include understanding of 'key operations' such as 'working with vectors' in mathematics. But this focus on concepts is justified not only by the fact that high-performing systems include such a focus, it is also strongly endorsed by theory. The crucial nature of 'organising concepts' has been highlighted in psychological research since the 1960s (Ausubel DP 1960).The more recent work on organising concepts (or 'schemata') has been used to develop highly effective medical training (Newble D & Clarke RM 1986). The research in this area is compelling. 'Organising concepts' are needed to facilitate retention in memory, develop economic mental processing, and support analytic reasoning. Concepts and principles are critical. The specific information embedded in contexts can decay into mere 'noise' unless individuals have concepts and principles to organise and interpret the content of those contexts. The critical role of concepts is reinforced by work on 'surface' and 'deep learning' (Black P & Wiliam D1998).

Work by Michael Shayer (King's College, London) (Shayer M & Ginsburg D 2009) suggests that, in England, 11 year olds' 'understanding of fundamental 'conservations' (of volume, of mass, etc) have decayed over the last two decades. The precise cause of this decay has not been established (change in children's play, increased focus on context rather than concepts in teaching and assessment have been postulated) but whatever the cause, this work highlights the importance of clear focus on development of these fundamentals. The later population of young people studied by Shayer were educated through the National Curriculum – the entitlement function appears to have decayed for these children.

Knowledge is, of course, fundamental – as is retention of information in memory (Wyer RS (ed) 1995). Pupils should emerge from schooling with large bodies of knowledge (Young M 1971; Young M 2010) – but the critical issue is this: organising concepts and principles are crucial to the acquisition and retention of this knowledge (Bernstein B 1971) – bodies of specific knowledge can be tied to the progressive development of these fundamental concepts and principles.

This discussion of content and context introduces a key notion. 'The National Curriculum' and 'the curriculum' should not be confused - it is vital to distinguish between them. The curriculum – taught and untaught –represents the totality of the experience of the child within schooling (aims, content, pedagogy, assessment). It includes unassessed and uncertificated elements – including opportunities to acquire

vital ‘personal’ and ‘social’ capitals. A national curriculum cannot specify and control all elements of the ‘real’ curriculum – and will run into terrible difficulty if it attempts so to do. A national curriculum operates as a means of giving all pupils access to a common body of essential content. It is vital to distinguish the role of national curricula in specifying conceptual and factual content, and the role of teachers in developing motivating teaching and learning.

The need for principled review

These perspectives help with a principled reduction of any unnecessary bulk in the National Curriculum. An evidence-based review is associated with principled rather than arbitrary reduction. Critically, these perspectives help refine an understanding of what a National Curriculum can, and should be expected, to achieve. By principled reduction, I refer to an approach which appeals to well-grounded theory regarding the sequencing of material, aims to secure a degree of specificity in the statements which enables the construction of sound assessment, and allows an enduring National Curriculum to be created. The England National Curriculum is, in law, an expression of content, and of aims and values. It cannot do everything. To expect it so to do will most likely result in failure. Any revision of the National Curriculum is a sophisticated undertaking: it has to acknowledge that its content and shape has profound implications and yet it is not the sole instrument of educational success.

International comparisons are important here. They can illuminate seemingly simple questions – such as at what age it is possible to teach content such as fractions, or algebra, or specific scientific principles – but they also enable a far deeper understanding of the role of different elements of national policy.

Highlighting the importance of using evidence from international comparisons is not arguing for naïve descent into policy borrowing – ‘…country X has been successful in PISA so therefore we need to do exactly what they are doing…’. A more sophisticated means of learning from other high performing nations is required (Green A 1997). For example, there may be a temptation to say ‘…Finland is regarded by all as superlative…let’s see how they teach…’. Paul Andrews’ analysis of Finnish maths teaching (Andrews P 2010) suggests that key elements of national culture allow teaching approaches of a quite unpromising kind to result in high standards – there is societal commitment to high levels of attainment, a long history of high standards of literacy and involvement in reading, and an expectation of high levels of parental involvement in learning. He thus argues, on these and many other grounds, that simply to import Finnish classroom practice into the UK would be a gross error. This approach shows us how to look at other systems in order to understand high performance. More on Finland later.

Singapore is an interesting case. Firstly, like many of the high-performing systems, it is small:

Singapore	4,839,400	(world bank)
Finland	5,313,399	(worldbank)
Hong Kong	6,977,770	(worldbank)
Mass	6,593,587	(uscensus)
Alberta	2,974,807	(finance and enterprise Alberta)
England	51,460,000	(office for national statistics)

This has considerable implications for improvement strategies. While large systems may have greater potential for important innovation to occur, they have greater challenge in disseminating that innovation in order to secure system improvement.

Change processes possess higher risk in respect of misappropriation and distortion. Inertia is higher. What is striking in some of these smaller contexts is the concerted drive towards improvement; the Singaporean system is characterised by a common, strong commitment to innovation and enhancement of practice (Wong R 1974; Luke A, Freebody P, Shun L and Gopinathan S 2005).

If one accesses the Singaporean National Curriculum statements (Singapore Ministry of Education 2010) then one will find a national curriculum framework characterised by very high level statements of aims and values, with a very obvious commitment to development of broad social skills. This might lead to an immediate assumption that a National Curriculum in England should develop a national curriculum at a similar level of generality and with a similar focus. This would be a grave error. Just by looking at the national curriculum framework, one is not looking at the other, very significant, things which are used for curriculum control. The current success of Singapore was secured through policy tightly directed at enhancing teacher expertise and, critically, by promoting 'curriculum coherence' through approval of text books and teaching materials. High stakes primary assessment for allocation to secondary schools plays an important role, as does a culture of commitment to education. Superficial examination of other national curriculum frameworks – or limited examination of only selected aspects of a system - can be highly misleading.

One key problem in using the results of international surveys (TIMSS, PISA and PIRLS), is the simple, yet difficult, problem of time lag. It is a mistake to look at the success of a national system in the surveys and then assume that the country's current arrangements should be copied. In reality, we can only use the outcomes of these surveys to make claims about the form of the system which *preceded* the testing in these surveys – the system as it existed some years ago – ie the form of the system in which the 15 year olds tested in PISA were educated. We can attend with confidence only to the things which made their systems a success. The things which they are doing now - the reforms which they are introducing – are of interest, but are unproven.

Finland is an extremely interesting case. Its high performance in PISA has prompted a vast increase in 'educational tourism' to its shores (Guardian 2003). Many analysts conclude that high levels of autonomy to schools, small homogenous schools and the absence of setting and streaming are keys to their success. But appearances can indeed be deceptive.

On school autonomy: Finnish society is one which, from 1686, legally enforced literacy through demanding it as a requirement of marriage (Observer 2005; Moore T 2008); had a national curriculum since 1881 (Nurmi V 1990; Kantola j, Nikkanen P, Kari J & Kananoja T 1999); and the reform processes of the 1960s – which saw the country move from lower to exemplary performance in international league tables - were very tightly controlled from the centre (Sahlberg P 2009; Frassinelli L 2006). Finland tightly controlled textbooks and teaching materials, then relaxed that control once the necessary curriculum coherence was in place. This is a vital issue to which this paper returns later.

On small, homogenous schools: schools in Finland have, traditionally, been small, well-integrated into the communities from which their pupils come, and with little ethnic diversity. This is not something which readily can be replicated in other nations – social composition simply is different in other nations. Finland has, however, embarked on a radical process of school closure, which is changing the structure and composition of the schools, and the relation between schools and the society in which they are located (Hargreaves A, Halasz G & Pont B 2007; Kalaoja E &

Pietarinen J 2009; Stats Finland 2010). There is a growing problem of Finnish families withdrawing children from schools due to the cultural diversity of the school population (Dutton E 2010). In embarking on closure of certain types of schools, Finland may be departing from the very things which assured its current success, as measured through the international surveys of its teenage children.

On setting and streaming: the absence of obvious setting and streaming in the early years has struck many visitors to Finland, and many commentators immediately attribute success to the absence of these in the system. Yet again, care needs to be taken. Little recognised outside Finland, the Finnish system has a vocational route at 16 (into which 41 pc progress at the age of 15) (Parkes D 1993; Dutton E op cit: Helsinki Municipality 2010) and this provides strong 'washback' into the system regarding incentives – it is not regarded as a high status route (Dutton E op cit), and this incentivises young people to attain in the academic route.There also are important educational strategies in place which are arguably of more importance than setting and streaming. If a young pupil is absent from school, even for short periods, they gain immediate referral to specialists after they return, to ensure that they master any elements which may be essential to them and which they may have missed through their absence. Cultural elements are also powerful. Family learning and early literacy are essential elements of Finnish society. Aided by a language which is far simpler than English, literacy becomes an early platform for learning (Aunio P, Aubrey C, Godfrey R, Yuejuan P & Liu Y 2006) and two aspects of family learning support high attainment: a strong commitment to learning amongst all social groups (BBC 2010; Andrews P op cit) and an equally strong emphasis on discussion and support to pupils in the home (Aunio P, Aubrey C, Godfrey R, Yuejuan P & Liu Y op cit; Andrews P op cit). Observational work on classroom interactions in Finland reveal very low levels of interaction and very 'stilted' lessons compared to other cultures (Andrews P op cit). Only when family learning is taken into account can it been seen that the students pick up queries and engage in more active learning through discussion and exploration in the home environment.

Current trends in Finland hint at the aspects of the system which the Finns themselves link with the performance of the system: the schools closure plan is highly controversial; parents are withdrawing students in urban schools with a mother tongue other than Finnish; and there are similar concerns voiced by Finnish universities as in England, regarding school maths attainment which fails to meet the requirement of HE courses (Tarvainen K & Kivela S 2005; Dutton E op cit).

None of this analysis in intended to detract from the enormous achievements of Finland in raising the performance of their system – it is analysis vital for the understanding of the mechanisms in operation and the extent to which they illuminate the policy possibilities in England. Indeed, this description is not a full analysis of the Finnish context and the causes of Finnish high performance in PISA, nor is Finland the only country in which we should have interest. Hong Kong, Singapore, Alberta, and Massachusetts, all hold considerable interest in respect of developments in national curricula. Research on pedagogy in Taiwan, China and Japan is highly revealing (Stigler & Stevenson op cit) and maths pedagogy in Flanders has recently come to the fore (Andrews P 2007).

What this limited examination of Finland tells is this: in interpreting the success of others, great care needs to be taken. Easy to state and simple in form, analysts and policy-makers ignore this advice at their peril.

Firstly, if we are interested in evidence, we should be looking at the things in each system which correspond to the period about which we have evidence – for Finland,

it may be far more profitable to look at the nature of the reforms which they introduced in the 1960s rather than assume that the current relaxation of requirement would automatically result, in another national context, in elevation of educational attainment – indeed, it may ultimately not work for them; the jury must, by necessity, be out.

Secondly, while the simple rule of caution outlined above is vital, there are sophisticated ways of looking at other systems which enable us to usefully 'hold up a mirror to our own system' and develop robust policy regarding the functions, form and content of a National Curriculum for England and the measures around it.

Understanding 'Control Factors'

A critical approach to transnational analysis suggests that we should use international comparisons to understand how different aspects of the system are subject to control and development, rather than engage in crude 'policy borrowing'. These 'control factors' exist in complex relations and balances:

1 curriculum content (national curriculum specifications, textbooks, support materials, etc.)
2 assessment and qualifications
3 national framework - system shape (e.g. routes, classes of qualifications)
4 inspection
5 pedagogy
6 professional development (levels and nature of teacher expertise)
7 institutional development
8 institutional forms and structures (e.g. size of schools, education phases)
9 allied social measures (such as that which links social care, health care and education)
10 funding
11 governance (autonomy versus direct control)
12 accountability arrangements
13 selection and gatekeeping (e.g. university admissions requirements)

These are very useful categories for looking at other nations' policy arrangements. Studying the relation between them in different countries allows us to understand the operation of our own system. It is important to understand that, despite comparatively low rates of pay (OECD 2010) Finnish teachers enjoy high social status, and all have a high level of formal qualification (to Masters level).The importance of teaching quality, approaches to learning and task design is strongly reinforced in the work of Hattie (Hattie J 2003), Wiliam (Black P & Wiliam D op cit), Watson (Watson A undated; Watson A & Ollerton M 2005) Andrews (Andrews P 2007; Andrews P 2010) and Stigler & Stevenson (Stigler & Stevenson op cit). This is an important factor in national success, amongst others. A country's national curriculum – both its form and content – cannot be considered in isolation from the state of development of these vital factors. They interact. Adjust one without considering development of the others, and the system may be in line for trouble (Green A 1997). Of equal importance, transnational analyses can provide evidence-based design principles which were absent from the 2007 revisions to the National Curriculum. Key amongst such work is Schmidt and Prawat's analysis of 'curriculum coherence' (Schmidt W & Prawat R 2006). This is strongly grounded in evidence from TIMSS, and argues that 'curriculum coherence' is vital, and is associated with high performing systems. This is not just a trivial, common-language use of the term 'coherence'. A system is regarded as 'coherent' when the national curriculum content, textbooks, teaching content, pedagogy, assessment and drivers and incentives all are aligned and

reinforce one another. '…Curricular materials in high-performing nations focus on fewer topics, but also communicate the expectation that those topics will be taught in a deeper, more profound way...' (Schmidt W & Prawat R 2006 p1). Their analysis of mathematics emphasises that 'curriculum coherence' should also be demonstrated through arranging concepts in an appropriate age-related hierarchy. Their more extended analysis of the nature of national control suggests that there is no rigid association between a system possessing curriculum coherence and being subject to tight, 'top down' control, nor it being devolved – the group of countries which exhibit curriculum coherence includes examples of both.

From this emerge three distinct principles:

- that 'curriculum coherence' should be a fundamental policy aim
- that the National Curriculum should be arranged into an evidence-based age-related hierarchy
- that the mechanisms for control, in order to ensure coherence, rely on subtle management of the interacting control factors in a system

These latter two points require further discussion.

Firstly, on models of progression and hierarchies: the National Curriculum currently uses the eight-level scale and levels descriptors as key elements of its model of progression, in all subjects. There is scant rationale – other than an unreflective drive to 'system tidiness' – for adopting exactly the same detailed structure in different subjects. In fact, both theory and empirical work on the structure of knowledge suggest quite the reverse should be the case (Hirst P & Jenkins E op cit). If a National Curriculum is stated in a way that the model of progression does not tie with fidelity to the cognitive development of young children, then this will severely compromise assessment, the rate of learners' learning, their engagement with learning, and so on. The transition between key phases (early years to primary, primary to secondary) will be dysfunctional. Material placed too early in the structure will provide too great a challenge. Material placed too high in one subject may be out of synch with what is required in other subjects (particularly true of maths and English). Assessment in national tests will be highly problematic (as has been seen in the development of the Single Level Tests). The model of progression and the placing of material in an appropriate age-related position must be based strongly on evidence, including the consideration of concepts of 'spiral curriculum' present in frameworks such as that in Hong Kong (Morris P 1996; Lo JT undated) – where reinforcement of earlier learning occurs through successively more demanding application.

The original National Curriculum adopted an identical 10-level structure from Key Stage 1 to the end of Key Stage 4, in all subjects, and included implicit assumptions that progression and development are identical in different subjects. The current ***operational*** model of levels has moved incrementally from the original model to a point where levels cannot be considered robust. The need for more detailed measurement has given us levels 4a,4b and 4c and so on – yet the actual meaning of these in terms of children's progression in key concepts and mastery of key knowledge cannot be justified adequately – the concept of 'levels' has been subject to policy drift. The levels reported from national tests are based on accumulations of marks – when a learner has been awarded a given level (say level 5) the marks that contribute to this may have been gained from success in questions targeted at level

4, level 5 and/or level 6. Remembering that levels span around two years of study, this is not the model which was originally suggested, nor the model implied by the legislative base of the National Curriculum – which suggests that a specific learner is assessed as being at a given level. This explains why schools are so interested in getting the test papers back, and then poring over them. They can only make sense of their results by looking at the strengths and weaknesses of the children in respect of the specific questions asked, not on the basis of the levels awarded. Ian Schagen put this well: '…we spent all our time taking the detail and adding it all up into National Curriculum Levels, and then the moment we've got them, we can only make sense of them by breaking it all back down again…' (Statistics Commission 2004).

While each subject should be expressed in a way which makes clear the nature of progression within the subject, it is vital to recognise that the structure of knowledge, the nature of enquiry and the modes of learning are different in different disciplines (Hughes-Warrington M 1997, Baird D et al (eds) 2006, Jenkins E 2007; Young M 2010); damage is done to them by forcing them into an insensitive common frame. In the National Curriculum, it is essential that sequencing of dependent material across subjects should be correct – ie if physics presupposes that certain maths is required then this should be synchronised with the maths curriculum – but this does not require a common framework to be adopted across different subjects. This raises the question of the authenticity and wisdom of retaining 'traditional' subject demarcations. Retention of these demarcations in the English system has been characterised as regressive and outmoded (Johnson M et al 2007; The Sunday Times 2007), often by superficial appeal to other systems. However, it is misleading to look at the 'organising categories' of other nations' systems – and in many ways, illusory. In high-performing systems which do not use the categories of Maths, Biology etc as top level organising categories, 'traditional' subject content (adding fractions, the structure of cells, etc) can be found beneath the surface of the curriculum – either in the lists of specific content in curriculum statements, or in the content of approved textbooks. 'Traditional' versus 'regressive' is a false and simplistic opposition. In all high-performing systems, the fundamentals of subjects are strongly emphasised, have substantial time allocation, and are the focus of considerable attention in learning programmes (Rudduck G & Sainsbury M 2008; Stigler J & Stevenson H 2006).

Secondly, on the concept of control: Schmidt's work suggests that a level of control must be exercised in a system in order to promote a necessary level of curriculum coherence. Once again, it is vital to recognise that the National Curriculum cannot, by itself, guarantee curriculum coherence in the system. A system is regarded as 'coherent' when the national curriculum content, textbooks, teaching content, pedagogy, assessment and drivers and incentives all are aligned and reinforce one another. For this to be the case, a certain level of control is necessary. Crucially, Schmidt and Prawat's comparative work suggests that this level of control need not necessarily derive from top-down measures. It is more that the system must ***exercise control***, not that individual agencies should ***take control***:

> '…our purpose in introducing alternative ways to govern curriculum…is not to advocate one approach or another. As analysis by Cochran-Smith and Fries (2001) indicates, disagreements about teaching and, by implication, curriculum, often divides along ideological lines, an outcome that occurs no matter how pragmatic the veneer. A functional approach, by specifying in advance the criteria that an effective curriculum-governance system must meet, lessens the tendency to judge these systems in terms of the political values they represent (eg regulation vs deregulation, public interest vs private interest…' (Schmidt, p656).

Their analysis suggests that the existence of curriculum coherence through curriculum control is essential; the precise institutional and system form to achieve this can vary. The list of 13 policy control-factors should be interpreted in the light of this. An effective approach to improving education in England will not be associated with slavishly adopting isolated aspects of other systems. Rather, we should be concerned with scrutinising other high-performing systems in order to understand how different aspects of education policy in England can be adjusted to deliver curriculum coherence, using a pattern of control and governance which is both suitable and effective in the English setting. As with the problems with using a single overarching structure for different subjects within the formal statement of the National Curriculum, it may well be that, at the current time, different mechanisms for curriculum control are necessary in different subjects. A greater supply of specialist teachers may be essential in some subjects. Just as Finland's current success can be traced to highly centralised control in previous decades, including control of textbooks, provision of highly specific learning materials and staff development may be required in certain subject areas and phases – without any necessary pre-judgement about which agencies may be best placed to manage such provision. Critically, if the National Curriculum is to be refined, in order to facilitate high-quality approaches to contextualisation, task design etc, then other measures (across the list of 13 factors) will be required to ensure that such developments are realised in the system – perhaps associated with initial teaching training, or with continuing professional development, or with a new generation of textbooks – or all three of these. Without this, curriculum coherence and entitlement will not be attained.

Conclusion

The National Curriculum in England continues to manifest significant structural problems. These need to be corrected prior to securing a period of essential stability in arrangements. The analysis presented here also asserts that refining the content of the National Curriculum is a necessary, but not sufficient, condition of an improved education system. Whilst the transnational comparisons help with the focus and sequencing of the content, it is essential to abide by the disciplines of an evidence-driven process. One of the major concerns of the revision processes adopted previously is that they have lapsed into a drive towards consensus. Social support for a National Curriculum is vital – any National Curriculum must enjoy high levels of societal support and confidence - but there are indications that the developers involved in the recent reviews were preoccupied with generating consensus. Margaret Archer and Andy Green - some of our best international comparativists – argue that the education system in England is characterised by a problematic level of consensus-seeking (Archer M 1979; Green A 1990). Generic statements of content may appease different educational lobbies, but simply because each can find what they want in such statements. They may thus appear permissive in a helpful way, but they may instead simply be vague and unhelpful (Guardian 2009). The 2007 revisions to the National Curriculum statutory content in Chemistry in the secondary phase state that pupils must understand 'that there are patterns in the reactions between substances'. Seemingly innocuous due to its generic character, this is, in fact, highly problematic. This statement essentially describes ***all*** of chemistry. So what should teachers actually teach? What are the key concepts which children should know and apply? The concept of entitlement becomes seriously eroded, if not absent, from a National Curriculum formed of such generic statements. Assessment becomes highly problematic, since a clear specification of what should be assessed becomes impossible. Assessment degrades into 'ambush assessment' since learners and teachers may not, in the school curriculum, have focussed on that which appears in a specific national test. Frantic search, by teachers and parents, for past test papers thus ensues, and the curriculum degrades into 'that which will be

assessed' (Mansell W 2007; Stobart G 2008). Assessment developers, teachers, pupils and parents all are disadvantaged when this occurs. Statements which 'keep all happy' in fact detract from the very purpose of the National Curriculum.

Where does this leave us, and in which direction does the analysis point us?

1
There is sufficient evidence of accumulated structural and operational problems to give clear grounds for a review of the National Curriculum.

2
Analysis of high performing systems, when treated with sophistication and sensitivity, can be used for determining which content should be placed where in a revised National Curriculum.

3
Securing 'curriculum coherence' is a vital objective in refining the National Curriculum.

4
A well-defined and enhanced National Curriculum is a necessary but insufficient condition for ensuring that the performance of the English system approaches that of the leading nations – policy needs to be formulated in respect of other 'control factors' such as teacher expertise, teaching quality, learning materials and inspection.

5
A well-defined and enhanced National Curriculum – based on concepts, principles, fundamental operations and key knowledge - can lead to learning processes which are more focused on deep learning (fewer topics pursued to greater depth), and to assessment processes of greater validity and which have beneficial wash back into learning.

Tim Oates
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References

Alexander R (ed) 2010 *Children, their world, their education* Routledge

Andrews P 2007 *Mathematics teacher typologies or nationally located patterns of behaviour* International Journal of Educational Research vol46 no5 pp306-318

Andrews P 2010 *International comparisons of mathematics teaching*: searching for consensus in describing opportunities for learning available at http://www.icme-organisers.dk/dg11/paper/Paul%20Andrews.pdf accessed 02 11 10

APA 1999 *The standards for educational and psychological testing* American Psychological Association

Archer M1979 *Social Origins of Educational Systems* Sage

ARG & TLP 2009 *Assessment in schools: fit for purpose?* Teaching and Learning Research Project, Institute of Education

ARG 2002 *Testing, motivation and learning* University of Cambridge Faculty of Education

Askew M & Hodgen J et al 2010 *Values and Variables: Mathematics education in high-performing countries* Nuffield

Aunio P, Aubrey C, Godfrey R, Yuejuan P & Liu Y 2006 *Children's early numeracy in England, Finland and People's Republic of China* International Journal of Early Years Education vol16 no3 p 203-321

Ausubel DP 1960 *The use of advance organizers in the learning and retention of meaningful verbal material* Journal of Educational Psychology vol51 no5 pp267-272

Baird D et al (eds) 2006 *Philosophy of Chemistry: synthesis of a new discipline* Boston Studies in the Hughes-Warrington M 2002 Collingwood and the early Paul Hirst on the Forms of Experience – knowledge and education British Journal of Educational Studies vol45 no2 pp156-173

Barber M 2002 *Crossing the bridge* Association for Achievement and Improvement through Assessment

BBC 2007 *How will flexible curriculum work?* 05 02 2007 available at http://news.bbc.co.uk/1/hi/education/6332537.stm accessed 10 11 10

BBC 2010 *Why do Finland's schools get the best results?* available at http://news.bbc.co.uk/1/hi/8601207.stm accessed 06 06 10 http://news.bbc.co.uk/1/hi/education/7913615.stm

Bernstein B 1971 *Class, Codes and Control* vol 1 London; Paladin

Black P, Harrison C, Lee C, Marshall B & Wiliam D 2003 *Assessment for learning: putting it into practice* McGraw Hill

Black P & Wiliam D 1998 *Inside the Black Box* King's College London

Black PJ 1994 *Performance Assessment and Accountability: The Experience in England and Wales Education Evaluation and Policy Analysis vol 16 no2 191-203*

Brooks R & Tough S 2006 *Pupil Attainment: time for a 3Rs guarantee* Institute for Public Policy Research

Burgess H 2008 *Primary Workforce Management and Reform* (Primary Review Research Survey 6/4), University of Cambridge Faculty of Education

Cambridge Assessment 2009 *The Cambridge Approach* Cambridge Assessment

Children, Schools and Families Committee 2008 *Testing and assessment – third report of session* 2007-08 volume 1 Stationery Office

Children, Schools and Families Committee for Education and Skills 2010 5 *Conclusion: complexity, consistency and coercion* Available at http://www.publications.parliament.uk/pa/cm200910/cmselect/cmchilsch/88/8809.htm accessed 05 11 10

Children, Schools and Families Committee *2009 Memorandum* submitted by The Association of Teachers and Lecturers (ATL) available at http://www.publications.parliament.uk/pa/cm200809/cmselect/cmchilsch/344/8061102.htm accessed 09 11 10

Chitty C 2002 *Understanding Schools and Schooling Series: Key Issues in Teaching and Learning* Routledge Falmer

Chitty C 2004 *Educational Policy in Britain* Palgrave Macmillan

Colwill A & Peacey N 2003 *Planning, teaching and assessing the curriculum for pupils with learning difficulties: curriculum guidelines to support the revised National Curriculum* British Journal of Special Education vol28 no3 0pp120-122

Conway D 2010 *Liberal Education and the National Curriculum* Civitas

Cook J undated *Assessment driven learning* School of Computing and Mathematical Sciences,
Glasgow Caledonian University, Glasgow

Daugherty R 1995 *National Curriculum Assessment: a review of policy* 1987-1994 Falmer

Dearing R 1994 *The National Curriculum and Its Assessment* (Dearing Report)

Dobson J & Pooley CE 2004 *Mobility, Equality Diversity: a study of pupil mobility in the secondary school system* Department of Geography, University College London

Doddington C, Flutter J & Rudduck J 1999 *Exploring and explaining 'dips' in motivation and performance in primary and secondary schooling* Research in Education 61 pp29-38

Dutton E 2010 *No simple task for the UK to Finnish what it's started* Times Educational Supplement 05 20 10

Edgar J 2007 *School science: a questionable construct?* Journal of curriculum studies vol39 no3 pp265-282

Evangelou, Maria and Taggart, Brenda and Sylva, Kathy and Melhuish, Edward and Sammons, Pam and Siraj-Blatchford, Iram (2008) *Effective Pre-school, Primary and Secondary Education 3-14 Project (EPPSE 3-14): What Makes a Successful Transition from Primary to Secondary School?* DCSF Research Report, DCSF-RR019 Institute of Education, University of London/ Department for Children, Schools and Families, London

Frassinelli L 2006 *Educational reform in Finland* Michigan State University

Gipps C 1994 Beyond Testing: towards a theory of educational assessment Routledge

Gipps C & Stobart G (undated) *Developments in GCSE* available at http://www.aseesa-edu.co.za/newpage5.htm accessed 05 11 10

Golby M 1994 *After Dearing: A critical review of the Dearing Report* Curriculum Journal vo5 iss1 pp95-105

Graham D & Tytler D 1993 *A Lesson for Us All: the making of the National Curriculum* Routledge

Gray J, Hopkins D, Reynolds D, Wilcox B, Farrell S & Jesson D 1999 *Improving Schools: Performance and Potential* Open University Press DES 2010 Standards Site http://www.standards.dfes.gov.uk/schemes3/ accessed 04 11 10

Green A 1990 *Education and State Formation: The Rise of Education Systems in England, France and the USA*. Palgrave

Green A 1997 *Education, Globalisation and the Nations State* Palgrave

Guardian 2003 *Heaven and Helsinki* Guardian 16 09 03

Guardian 2009 *Secondary curriculum is 'too vague', exam assessors warn* Guardian 20 10 2009

http://www.guardian.co.uk/education/2007/feb/05/secondaryschools.politics

Gupta A 2007 *Constructivism and peer collaboration in elementary mathematics education: the connection to epistemology Eurasia* Journal of mathematics, science and technology education vol4 no4 pp381-386

Hargreaves A, Halasz G & Pont B 2007 *School leadership for systemic improvement in Finland – a case study report for the OECD activity improving school leadership* Organisation for Economic Co-operation and Development

Harlen W 2008 *Science as a key component of the primary curriculum: a rationale with policy implications*. Perspectives on Education 1 (Primary Science), 2008:4–18

Hattie J 2003 *Teachers make a difference – what is the research evidence* Australian Council for Educational Research

Helsinki Municipality 2010 *Education routes* available at http://www.hel.fi/hki/opev/en/Education+for+foreigners/The+Finnish+education+system accessed 11 11 10

Hempenstall K 2009 *Research-driven reading assessment: Drilling to the core* Australian Journal of Learning Difficulties vol14 no1 pp17-52

Hirst P 1974 *Knowledge and the Curriculum* Routledge and Kegan

Hirst P 1975 *The nature and structure of curriculum objectives*. In *Curriculum Design* 1975 edited by Golby, M et al Open University Books

Hopkins D 2001 *School improvement for real* Routledge

House of Commons Children, Schools and Families Committee 2008 *Testing and Assessment Third Report of Session 2007–08* Volume I House of Commons

House of Commons Children, Schools and Families Committee 2009 *National Curriculum Fourth Report of Session 2008–09* Volume I Report, together with formal minutes Ordered by the House of Commons 11 March 2009

Jenkins E School science: a questionable construct? 2007 Journal of Curriculum Studies vol39 no3 pp265-282

Johnson M et al 2007 *Subject to Change: New Thinking on the Curriculum* Association of Teachers and Lecturers

Kalaoja E & Pietarinen J 2009 *Small rural primary schools in Finland: a pedagogically valuable part of the school network* International Journal of Educational Research vo48 no2 pp109-116

Kantola j, Nikkanen P, Kari J & Kananoja T 1999 T*hrough education into the world of work* Uno Cygnaeus, the father of technology education Institute for Educational Research University of Jyvaskyla

Lawton D 1980 *Common Curriculum or Core Curriculum International Journal of Research & Method in Education* vol3 no1 pp 5-10

Lawton D 2008 *The National Curriculum Since 1988: panacea or poisoned chalice?* FORUM vol 50 no3 pp337-342.

Lebus S 2010 *Opening Address to Cambridge Assessment Network Conference 2010* http://www.cambridgeassessment.org.uk/ca/digitalAssets/188052_5th_Cambridge_Assessment_Conference_SL_opening_remarks.pdf accessed 10 11 10

Leney T & Coles M 2001 *Scenarios and strategies for vocational education and training in the United Kingdom Qualifications and Curriculum Authority*

Lo JT undated *The primary social education curricula in Hong King and Singapore: a comparative study* Hong Kong Institute of Education

Luke A, Freebody P, Shun L and Gopinathan S 2005 *Towards research-based innovation and reform: Singapore education in transition.* Asia Pacific Journal of Education vol25 no1 pp. 5-28
Singapore Ministry of Education 2010 http://www.moe.gov.sg/ accessed 01 10 10

Machin S & McNally S 2006 *Gender and student achievement in English schools* Centre for the Economics of Education

Mansell W 2007 *Education by numbers: the tyranny of testing* Politicos

Massey A, Green S, Dexter T & Hamnett L 2003 *Comparability of national tests over time: Key stage test standards between 1996 and 2001: Final report to the QCA of the Comparability Over Time Project* University of Cambridge Local Examinations Syndicate

Mcculloch G 2005 *Curriculum Reform, Educational Change and School Improvement The Practice and Theory of School Improvement III* pp169-181 Springer

McKenzie P & Wurzburg G 1997 *Lifelong learning and employability* The OECD Observer Jan. 1997: 13-17

Mislevy R, Steinberg L, Almond RG, Haertel GD, & Penuel R 2003 *Leverage points for improving educational assessment (PADI Technical Report 2).* Menlo Park, CA: SRI International

Moore T 2008 *Finnish education system Research paper* 46/08 Northern Ireland Assembly

Morris P 1996 *The Hong Kong school curriculum: development, issues and polices* Second edition Hong Kong University Press

Newble D & Clarke RM 1986 *The approaches to learning of students in a traditional and in an innovative problem- based medical school* Medical Education, vol20 pp267-273.

Nurmi V 1990 *Education in Finland* Vol4 no2 International Journal of Educational Management

Oates T 2005 *Letter: Re Peter Tymms' Report: Are standards rising in English primary schools?* Annex A to Statistics Commission 2005 Measuring standards in English primary schools Statistics Commission

Observer 2005 *Inside the best school in the world* 25 09 05

OECD 2010 *Teachers' pay and conditions* available at http://www.oecd.org/dataoecd/39/62/1840245.pdf accessed 06 06 10

OECD 2010 *The high cost of low educational performance – the long-run economic impact of improving PISA outcomes* Organisation for Economic Co-operation and Development

Parkes D 1993 *Partity of esteem for vocational education?* European Journal of Education vol28 no2

Pepper D 2007 *The Key Stage 3 dip: myth or reality?*

Priestly M & Higham J (undated) *New Zealand's curriculum and assessment revolution* School of Education University of Leeds

Pollard A, Broadfoot P, Croll P, Osborn M & Abbott D 1994 *Changing English Primary Schools? The Impact of the Education Reform Act at Key Stage One* Cassell

Powell R, Smith R, Jones G, Reakes *A 2006 Transition from Primary to Secondary School: Current Arrangements and Good Practice in Wales* National Foundation for Educational Research

QCA 2005 *Mathematics 2004/5 annual report on curriculum and assessment* Quallifications and Currculum Authority

QCA undated *The new secondary curriculum. What has changed and why* Qualifications and Curriculum Authority

QCDA 2010 *Values aims and purposes* available at http://curriculum.qcda.gov.uk/key-stages-1-and-2/Values-aims-and-purposes/index.aspx
Accessed 09 11 10

Rawling E 2001 *Changing the subject: the impact of national policy on school geography 1980-2000* Geographical Association

Ruddock G & Sainsbury M 2008 *Comparison of the core primary curriculum in England to those of other high performing countries* – Research report DCFS-RW048 Department for Children Schools and Families

Ruddock G, Sturman L, Schagen I, Styles B, Gnaldi M and Vappula H 2004 *Where England Stands in the Trends in International Mathematics and Science Study (TIMSS) 2003: National Report for England*. Slough: NFER

Rudduck J, Chaplain R & Wallace G (eds.) 1996 *School Improvement: What Can Pupils Tell Us?* David Fulton

Sahlberg P 2009 *A short history of educational reform in Finland* European Training Foundation

Salter B & Tapper T 1981 *Education, Politics and the State: The Theory and Practice of Educational Change* Grant McIntyre

Sargent C, Byrne A, O'Donnell S & White E *Thematic probe. Curriculum review in the INCA countries: June 2010* National Foundation for Educational Research

Schmidt W & Prawat R 2006 *Curriculum Coherence and national control of education: issue or non-issue?* Journal of Curriculum Studies vol38 no6 pp641-658

Sebba J 2004 *Developing an Evidence-based Approach to Policy and Practice in Education* in Thomas G and Pring R 2004 Evidence Based Practice in Education OUP/McGraw-Hill

Shaw K 1993 *The Management of Central Government-imposed Initiatives International Journal of Educational Management* vol2 no1 pp7-15

Shayer M & Ginsburg D 2009 *Thirty years on – a large anti-Flynn effect? (II): 13- and 14-years olds. Piagetian tests of formal operations norms* 1976-2006/7 British Journal of Educational Psychology 79 pp409-418

Shepard L 2000 *The role of classroom assessment in teaching and learning* CSE technical report 517 CRESST/University of Colorado at Boulder

Simon B 1993 *The Education Reform Act: Causative factors*. In P Broadfoot, D Nuttal, B Dockrell, C Gipps (eds). Policy Issues in National Assessment. BERA Dialogues 7. Clevedon: Multilingual Matters; 1993

Smith J & Spurling A 2001 *Understanding motivation for lifelong learning* National Institute of Adult and Continuing Education

Statistics Commission 2004 *Report on the June 2004 Seminar on school level education statistics* Statistics Commission

Statistics Commission 2005 *Measuring standards in English primary schools* Statistics Commission

Stats Finland *2010 school closures data* available at http://www.stat.fi/til/kjarj/2007/kjarj_2007_2008-02-22_tie_001_en.html accessed 11 11 10

Strand S 2002 *Pupil Mobility, Attainment and Progress During Key Stage 1: a study in cautious interpretation* British Educational Research Journal, volume 28, Number 1 pages 63-78

Stigler J & Hiebert J 1999 *The Teaching Gap: The Best Ideas from the World's Teachers for Improving Education in the Classroom* Free Press

Stigler J & Stevenson H 1999 *How Asian teachers polish each lesson to perfection in Child growth and development* 6TH edition pp66-77 McGraw Hill

Stigler JW & Stevenson HW 2006 *The Learning Gap* Simon & Schuster

Stobart G 2008 *Testing times: the uses and abuses of assessment* Routledge

Tabberer R 1997 *Primary Education: expectations and provision* National Foundation for Educational Research

Tarvainen K & Kivela S 2005 *Severe shortcomings in Finnish mathematics skills* Matematiikkalehti Solmu

TES 2005 *Tests harm writing skills* http://www.tes.co.uk/article.aspx?storycode=2111790

TES 2008 *The changing curriculum – National curriculum timeline – Twenty Years of permanent revolution* Times Educational Supplement 25 07 2008

TES 2009 *Curriculum reform may widen gaps in performance* Times Educational Supplement 31 07 2009

TES 2010 *Trial's extension is cancelled following vociferous opposition from unions* Times Educational Supplement 10 09 10

The Sunday Times 2007 *Ditch Subjects, schools are told* The Sunday Times 24 06 2007

Tymms P 2004 *Are standards rising in English primary schools?* British Educational Research Journal 30(4): 477-494.

Tymms P & Merrell 2007 *Standards and quality in English primary schools over time: the national evidence Research Survey* 4/1 Esme Fairburn Foundation

Watson A & Ollerton M 2005 *Inclusive mathematics* Continuum

Watson A undated *Mathematical knowledge in secondary mathematics teaching* University of Oxford

Whetton C, Ruddock G & Twist L 2007 *Standards in English Primary Education: the International Evidence* (Primary Review Research Survey 4/2). University of Cambridge, Faculty of Education

Whetton C 2008 *The Big New Idea*: Single Level Tests Paper presented at the 34th International Association for Educational Assessment Conference, 8 – 12 September 2008, Cambridge, England.

Wong R 1974*Educational innovation in Singapore Experiments and innovations in education* no9 Unesco

Wood R 1993 *Assessment and testing* Cambridge

Woods P 1996 *Creative teachers in primary schools* Open University Press

Wyer RS (ed) 1995 *Knowledge and memory – the real story*. Advances in social cognition Vol VIII1995 Lawrence

Young M 1971 *Knowledge and control: new directions for the sociology of education* Open University

Young M 2010 *A curriculum for the 21ST Century OR Do subjects matter?* speech given to the Conference for Head Teachers organised by the Prince's Teaching Institute held at the Drapers Hall, 18 January 2010

Annex 1

Large-scale international surveys

PISA – Organisation for Economic Co-operation & Development
Programme for international student achievement
http://www.pisa.oecd.org/pages/0,2987,en_32252351_32235731_1_1_1_1_1,00.html
Surveys 15-year-olds in the 43 countries. Every three years (first PISA 2000), it assesses how far students near the end of compulsory education have acquired some of the knowledge and skills essential for full participation in society. The results of the PISA 2006 survey will be released on 4 December 2007.

TIMSS - International Association for the Evaluation of Educational Achievement
Trends in Maths and Science Study – IEA ttp://www.iea.nl/timss2007.html
Previous assessments 1995, 1999, and 2003, TIMSS 2007 extends this sequence, providing achievement data at four time points over a 12-year period.TIMSS 2007 will collect data in mathematics and science at fourth and eighth grades in over 60 countries.

PIRLS -International Association for the Evaluation of Educational Achievement
http://www.iea.nl/pirls2006.html
PIRLS 2006 is the second, after PIRLS 2001, in a five-year cycle of assessment – of students in the fourth grade of schooling - measures trends in children's reading literacy achievement. and policy and practices related to literacy.

Annex 2

PISA rankings

PISA 2006				
Ranking (Science)	**Country**	**Science**	Reading	Maths
1	Finland	563	547 (1)	548 (1)
2	Hong Kong - China	542	536 (2)	547 (2)
3	Canada	534	527 (3)	527 (3)
4	New Zealand	530	521 (4)	522 (4)
5	Australia	527	513 (5)	520 (5)
6	United Kingdom	515	495 (6)	495 (6)
7	United States	489	N/A	474 (7)

PISA 2003				
Ranking (Maths)	**Country**	**Maths**	Reading	Science
1	Hong Kong - China	550	510 (5)	539 (2)
2	Finland	544	543 (1)	548 (1)
3	Canada	532	528 (2)	519 (5)
4	Australia	524	525 (3)	525 (3)
5	New Zealand	523	522 (4)	521 (4)
6	United States	483	495 (6)	491 (6)
N/A	United Kingdom	N/A	N/A	N/A

PISA 2000				
Ranking (Reading)	**Country**	**Reading**	Maths	Science
1	Finland	546	536 (2)	538 (1)
2	Canada	534	533 (3)	529 (3)
3	New Zealand	529	537 (1)	528 (4)
4	Australia	528	533 (3)	528 (4)
5	United Kingdom	523	529 (5)	532 (2)
6	United States	504	493 (6)	499 (6)
N/A	Hong Kong - China	N/A	N/A	N/A

Annex 3

Public expenditure on education as % of GDP

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Australia	5.1	5	5.1	5	4.9	4.9	4.8	5.2	
Canada	5.7	5.6	5.1	5.2			4.9		
Finland	6.1	5.9	6	6.2	6.4	6.4	6.3	6.1	
Hong Kong Special Administrative Region of China			3.9	4	4.3	4.6	4.2	3.9	3.5
Japan	3.6	3.7	3.6	3.6	3.7	3.7	3.5	3.5	
New Zealand	6.9		6.8	6.6	6.7	6.8	6.5	6.2	6.3
Singapore			3.1						
United Kingdom of Great Britain and Northern Ireland	4.6	4.6	4.7	5.3	5.5	5.4	5.5		
United States of America	5.1		5.7	5.7	5.9	5.6	5.3	5.7	

From UNESCO Institute for Statistics (UIS)

Education at a Glance 2009: OECD Indicators - OECD © 2009 - ISBN 9789264024755

Indicator B1: How much is spent per student?

Table B1.4. Annual expenditure on educational institutions per student <u>for all services</u> relative to GDP per capita (2006)

	Primary to tertiary education
OECD countries	
United States	**31**
United Kingdom	**27**
Finland	**25**
New Zealand	**23**
OECD average	**26**
EU19 average	**24**

Source: OECD.