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Redesigning Schooling - 3

Principled curriculum design

Dylan Wiliam

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REDESIGNING SCHOOLING
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This publication

Audience: Education professionals at all stages and settings

Aims: Dylan Wiliam starkly outlines the challenge: 'the rather terrifying thing about being involved in education at the present time is that we are the first generation of educators who know we have no idea what we are doing.' This is because, although education is changing fast, the world is changing faster. Professor Wiliam explains what this means in terms of curriculum in our schools and outlines seven suggested principles of curriculum design. This pamphlet aims to help schools make curriculum development a planned and collegial process, and one that builds on the expertise of others.'

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Introduction

In recent years in England, discussion of the school curriculum has been all but absent. This neglect has been largely driven by the adoption in 1988 of a national curriculum for schools in England and Wales. Many teachers, leaders and policymakers assumed that because the government had specified what schools were required to teach, then no further discussion of the issue of curriculum was necessary.

This belief was mistaken for two reasons. The first is that the legal framework of the national curriculum specified only what schools were legally required to teach – any school was entirely free to teach whatever it wished in addition to the prescribed national curriculum. The second is that the real curriculum – the lived daily experience of young people in classrooms – requires the creative input of teachers. For example, the national curriculum may require that students learn about negative numbers, but the kinds of analogy that a teacher might use to teach this topic (e.g. heights above and below sea level, temperatures above and below zero, positive and negative bank balances, and so on) must be chosen with an understanding of the students, their experiences, and a range of other contextual factors. So the real curriculum is created by teachers, every day.

Curriculum development therefore takes place constantly in every school, but the lack of attention to this process means that it is rarely given enough time, is generally done by teachers working alone, and tends to be done as an ad hoc activity. The aim of this pamphlet is therefore to help schools make curriculum development a planned and collegial process, and one that builds on the expertise of others. Every school's curriculum has to be, by definition, unique, but by using the ideas in this booklet, schools can adapt and build on the work of others to design a curriculum that will meet the needs of their students.

The first chapter addresses, briefly, the different reasons we have for educating young people.

The second chapter discusses how the idea of 'curriculum' has evolved over the years, drawing in particular on the work of Ralph Tyler, Hilda Taba and Lawrence Stenhouse.

The third chapter shows why the development of the 'real' curriculum requires the involvement of teachers at each stage of the curriculum development process, and presents seven principles of curriculum design that need to be considered in the process, namely that a curriculum should be balanced, rigorous, coherent, vertically integrated, appropriate, focused, and relevant.

The fourth chapter presents some ideas that schools can use with their teachers and other stakeholders (e.g. governors, students, parents) in the development process of curriculum redesign.

Chapter 1
Why educate?

It is – just about – possible to imagine a world without schools. However, as Denis Lawton wrote:

> 'Certain aspects of our way of life, certain kinds of knowledge, certain attitudes and values are regarded as so important that their transmission to the next generation is not left to chance in our society but is entrusted to specially trained professionals (teachers) in elaborate and expensive institutions (schools)'. (Lawton, 1975: p.7)

The question that then arises is what kinds of knowledge, attitudes and values should be prioritised? Different authors have proposed different responses to this question, depending on what they conceive the purpose of education to be. However, it does seem that most of the justifications that have been made for mass public education can be grouped into four broad categories.

Personal empowerment: Arguably the most important aim of education is to allow young people to take greater control of their own lives, perhaps best exemplified by the work of Paulo Freire. The idea is

that rather than simply enculturating young people into the existing systems, education is the means by which people 'deal critically and creatively with reality and discover how to participate in the transformation of their world' (Shaull, 1970: p.34).

Cultural transmission: Another reason that is often given for educating young people is, in Matthew Arnold's words, to pass on from one generation to the next, 'the best that has been thought and known in the world' (Arnold, 1869: p.70). Those who do not know what people are expected to know are regarded as ignorant – not stupid, but simply lacking the knowledge expected of them.

Preparation for citizenship: Democratic citizenship arguably works only if those who are voting understand the choices they are given, and education therefore has a vital role to play in preparing citizens so that they can make informed decisions about their participation in democratic society (Council of Europe, 2010).

Preparation for work: As a number of reports from the Organisation for Economic Cooperation and Development have shown, more educated workers are more productive (e.g. Hanushek & Woessman, 2010). Educational achievement is therefore inextricably linked with economic prosperity.

The important point about these four broad philosophies of education is that they are not alternatives from which we can choose our favourites. All are important, and often in tension with one another, and so any education system is a – sometimes messy – compromise between these four sets of aims.

Finding an appropriate compromise between these different, and often conflicting, aims is made more difficult by the fact that the relationships

between the categories of aims are not fixed but are in constant flux. A compromise that works effectively today is not likely to be the best compromise in the future. As the world becomes more complex, what is needed for personal empowerment today may be completely inadequate in the future. As new forms of culture develop, some will be incorporated into the mainstream, and so 'the best that has been thought and known in the world' will change. The knowledge needed to participate effectively in democratic society will also change over time as young people increasingly adopt and adapt their roles as global citizens. And as offshoring and automation change the kinds of employment opportunities available for young people, the kinds of preparation young people receive for the world of work will need to change too.

Any education system is made up of a number of components, including schools, teacher training institutions, assessment systems, governance arrangements, and of course curricula. Each of these is important, and can have significant impact on the performance of the system, but it is important to note that these components differ substantially in how difficult they are to change, and also in the size of the impact of any changes on student outcomes. In particular, while none of these components is easy to change, it appears that attention to the issue of curriculum has the potential to be one of the most powerful levers for improving the performance of the system.

Chapter 2
What is curriculum?

The word 'curriculum' has no generally agreed meaning. One common meaning of the term is that it describes the educational experiences that are planned for learners in educational institutions. The term appears to have been first used in Scottish universities in the early seventeenth century as a description of the collection of courses followed by students. In his widely read *Principles of curriculum and instruction* (still in print more than six decades after its first publication), Ralph Tyler proposed that the curriculum should be seen as a means to an end, rather than an end in itself. He identified 'four fundamental questions which must be answered in developing any curriculum and plan of instruction' (Tyler, 1949: p.1):

1. What educational purposes should the school seek to attain?
2. What educational experiences can be provided that are likely to attain these purposes?
3. How can these educational experiences be effectively organised?
4. How can we determine whether these purposes are being attained?

One of Tyler's colleagues, Hilda Taba, elaborated Tyler's model, and in *Curriculum development: theory and practice* (Taba, 1962: pp.347-378) she proposed a seven-step model for curriculum development. The steps were:

- Diagnosing needs
- Formulating specific objectives
- Selecting content
- Organising content
- Selecting learning experiences
- Organising learning experiences
- Evaluating

A number of features of Taba's model are especially important. The first is that her first step acknowledged explicitly that the curriculum should start from the needs of the learner. David Ausubel once said 'if I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly' (Ausubel, 1968 p.vi). But Hilda Taba's prescription goes much further. She suggests that in addition to understanding what the student already knows,

> 'it is necessary to know something about students' cultural backgrounds, motivational patterns, and the content of their social learning, such as the particular meanings they bring to school, their particular approach to learning tasks, and the expectations they have of themselves and of others.' (p.234)

Second, in Taba's model, 'content' is more than just knowledge. Knowledge of facts, ideas and concepts are important, but so too are

reflective thinking, values and attitudes, and sensitivities and feelings. However, these aspects of content depend on how things are taught more than what is taught – in other words, we cannot really talk about curriculum without talking about pedagogy:

> 'The selection of content does not develop the techniques and skills for thinking, change patterns of attitudes and feelings, or produce academic and social skills. These objectives only can be achieved by the way in which the learning experiences are planned and conducted in the classroom.' (Taba, 1967: p.11)

Third, because Taba's model entails considerations of pedagogy, she rejected the idea that curriculum could be developed 'top-down' and imposed on teachers. For Taba, all seven stages of the curriculum development model had to be conducted with the involvement of the teachers who would be teaching it.

> We cannot really talk about curriculum without talking about pedagogy.

Once this is understood, we can see that the national curriculum is not really a curriculum at all. As with most national curricula, the national curriculum for England specifies what we want students to learn. This is sometimes referred to as the 'intended' curriculum. The intended curriculum then gives rise to textbooks, schemes of work, lesson plans and so on that form the 'implemented' curriculum. However neither the intended curriculum nor the implemented curriculum is the real curriculum. A great intended curriculum badly taught is likely to be a much worse experience for young people than a bad intended curriculum well taught. Pedagogy trumps curriculum. Or, to be more precise, because the real curriculum – sometimes called the 'enacted'

or 'achieved' curriculum – is the lived daily experience of young people in classrooms, curriculum *is* pedagogy.

The failure to realise that curriculum is pedagogy has been one of the great tragedies of the last quarter-century in England's education system. All over the country, teachers and leaders assumed that curriculum was a non-issue, because the government had decided what the curriculum should be. Of course teachers did try to design effective and engaging lessons, but too often this was treated as a straightforward process of 'delivering' the national curriculum.

The big point that was missed is that curriculum development is an inherently creative process. It is the process by which teachers take the desired outcomes from the intended curriculum and convert them into engaging activities in classrooms. Curriculum development is therefore not some special process done in committee meetings after school. Teachers create and develop curriculum every day, whenever they plan and deliver lessons. The question is whether this process is something that happens 'below the radar' in schools, with teachers working on their own, or whether it is given the explicit priority the task merits, given its importance, and is undertaken collegially.

> Curriculum development is the process by which teachers convert the desired outcomes into engaging activities in classrooms.

The challenge, of course, is that, as Grant Wiggins and Jay McTighe have pointed out, learning activities have to be designed backwards (Wiggins and McTighe, 2000). Anyone can stand in front of a class and tell the students what they need to know – it's just that most

students won't learn very effectively from that kind of teaching (although it's important to note that some certainly will). And anyone can think up interesting and engaging activities that will occupy students in classrooms, but unfortunately such activities do not always, or even often, result in valued learning for students. The challenge of translating the intended curriculum into the achieved curriculum is to engage students in interesting activities that nevertheless result in valued learning for students.

There is no standard set of techniques that teachers can learn for converting intended curriculum outcomes into engaging learning activities. As noted above, teachers are involved in creating curriculum every day, and so developing curriculum is much more organic and less linear than the models proposed by Tyler and Taba would indicate, as a number of authors have pointed out.

Kerr (1968) suggested that the curriculum was based on four elements: objectives, evaluation, knowledge, and school learning experiences, with the explicit expectation that the elements interact with each other, so that a change in one leads to changes in the others. Kerr also broadened the idea of a curriculum. In much early usage, 'the curriculum' referred exclusively to the formally timetabled educational activities in the school – as is clear from the designation of certain activities as 'extra-curricular.' Kerr proposed that the term curriculum should denote 'all the learning which is planned or guided by the school, whether it is carried on in groups or individually inside or outside the school' (p.16).

Towards the end of the 1960s, there was a vigorous debate in the anglophone educational research community about whether the curriculum should be subordinate to educational aims and objectives. At the annual meeting of the American Educational Research

Association held in Chicago in February 1968, a symposium specifically addressed this issue, but to a large extent, it seems that, to paraphrase Stevens (1946: p.677), participants left through the door by which they had entered.

One of the most vocal critics of the objectives approach was Lawrence Stenhouse. Drawing on the work of R.S. Peters (1966), Stenhouse suggested that the very idea of basing curriculum on objectives was misguided (Stenhouse, 1970). He pointed out that there were aspects of human experience that might be included because of their inherent value rather than because they were instrumental in achieving specified objectives. Moreover, he argued that objectives became simplistic and self-fulfilling, worked against the exploration of new ideas, and undermined the creativity of students and teachers. This was not least because objectives-based approaches place little importance on the desirability of teacher professional development (Stenhouse, 1985: p.80-81). Within such a model, Stenhouse argued, the teacher is treated as a kind of 'intellectual navvy, working on a site plan simplified so that people know exactly where to dig their trenches without knowing why' (quoted in Woods, 1996: p.24).

In contrast, Stenhouse suggested that any definition of curriculum should reflect its essentially dynamic nature: 'A curriculum is an attempt to communicate the essential principles and features of an educational proposal in such a form that it is open to critical scrutiny and capable of effective translation into practice' (Stenhouse, 1975: p.4). In other words, a curriculum is a proposal for action that is not necessarily right, but reasonable (Toulmin, 2001).

Stenhouse stated that such proposals should consist of three parts: planning, empirical study, and justification, each of which should specify a number of principles and guidance. Stenhouse explicitly

rejected the idea that a curriculum could be developed independently of considerations of how it was to be implemented – for Stenhouse, as for Taba, the involvement of teachers was essential. It is also important to note this was not done out of any misguided notion of professional respect, but due to the limitations of the communication process. Because each classroom was different, it was simply not possible to specify a way in which the same proposal could be implemented in the same way in different classrooms.

An important, and often neglected, feature of Stenhouse's position is that the traditional subject disciplines were essential to effective education. Because of his emphasis on the involvement of teachers, it is sometimes assumed that Stenhouse adopted an 'anything goes' approach to teaching. But that would allow teachers to impose their values on their students, which was not his intention:

> 'One of the main functional advantages of the disciplines of knowledge and of the arts is to allow us to specify content, rather than objectives, in curriculum, the content being so structured and infused with criteria that, given good teaching, student learnings can be treated as outcomes, rather than made the subject of pre-specifications. Disciplines allow us to specify input rather than output in the educational process. This is fairer to the needs of individual students because, relative to objectives, disciplined content is liberating to the individual.' (Stenhouse, 1970: p.77)

Lawton (1975) adopted a slightly different approach to the definition of curriculum. He suggested that 'the school curriculum (in the wider sense) is essentially a selection from the culture of a society' (p.7). The idea that curriculum is a selection from culture is at once both obvious and profound, drawing attention to the fact that what is in the curriculum is the result of choices that have been made during the

curriculum development process. Sometimes these choices are explicit, and at other times they are implicit. And sometimes what is left out speaks as loudly as what is included – what Elliot Eisner calls the 'null curriculum' which consists of 'the options students are not afforded; the perspectives they may never know about, much less be able to use; the concepts and skills that are not part of their intellectual repertoire' (Eisner, 1985: p.107).

The complexity of the foregoing argument should convince the reader that simplistic choices between child-centred versus subject-centred curricula, subject-based and theme-based curricula, or those that pitch emotional development against intellectual development, are unhelpful. Rather than 'either/or' thinking we need 'both/and' thinking. The curriculum should be child-centred and subject-centred (and society-centred too). It should regard emotional development and intellectual development not as alternatives but as strands in a rope, which mutually strengthen each other. The curriculum has to take into account the needs of individuals and society while at the same time being sensitive to local constraints and affordances.

What I think this means is that there can never be a satisfactory step-by-step model for curriculum development – the problem is just too complex to be solved with a recipe. Moreover, such a step-by-step model is unlikely to encourage the kind of creativity that is needed from teachers to produce effective, imaginative and engaging curricula. For this reason, I think it is more helpful to produce a number of design principles for curriculum that can be used to evaluate curriculum proposals as they are being developed. These principles will sometimes be in alignment and sometimes in tension, and so could be used to show where further work may be needed. They could also simply serve to show what is being lost in adopting a particular curriculum plan. The seven principles that I think are most important are presented in the next chapter.

Chapter 3
Principles of curriculum design

Everyone will have their own ideas about what the most important principles of curriculum design are. The more principles one has, the more likely the list is to be comprehensive but the more unwieldy it will be. A short list would be easy to use, but would miss out important aspects of good curricula that need to be borne in mind. In this sense, any list of principles of curriculum design can be thought of as a model of curriculum, and as the statistician George Box remarked, 'All models are wrong, but some are useful.' In this chapter, I discuss the seven principles of curriculum design that I think are most helpful and powerful in looking critically at school curricula. The list is not intended to be definitive – indeed I expect that readers will delete some and add others as they use the principles in their work – but I hope that it proves a reasonable starting point for schools.

Balanced

The rather terrifying thing about being involved in education at the present time is that we are the first generation of educators who know we have no idea what we are doing. In the past, education systems were designed to produce people who could act effectively in the world

as it existed then – a perfectly sensible strategy for a stable world, but a poor one for one in rapid flux.

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The speed of change is hard to grasp. In 1978, around 7 million people were employed in manufacturing in the UK, while today it is well below 3 million. In other words, over the last 35 years, we have lost well over 300 manufacturing jobs every single day. This is often assumed to be because 'we don't make stuff anymore' but this is not true. The value of UK manufactures has grown, in real terms, pretty steadily over the past 40 years, and the UK is still – in value terms at least – one of the world's top ten manufacturers. We still make things, but we don't use so many people to do so anymore.

While jobs may be being automated or exported to other countries with lower labour costs, new jobs are being created all the time. According to one estimate, at the moment there are over 300,000 people employed in writing apps for smart phones *(Economist*, 2012); jobs that did not exist even five years ago.

The problem is that although we know that the changes in the world will continue, and possibly even accelerate, we have no idea what is coming. Even as little as ten years ago, hardly anyone would have backed Wikipedia rather than Microsoft's Encarta encyclopaedia and yet today, Wikipedia goes from strength to strength, while Encarta was closed down in 2009. As Nils Bohr the physicist once said, 'Prediction is hard, especially about the future.' Our education system has to prepare our students for a world we cannot imagine:

> 'So the model that says learn while you're at school, while you're young, the skills that you will apply during your lifetime is no longer tenable. The skills that you can learn when you're at school will not be applicable. They will be obsolete by the time you get into the workplace and need them, except for one skill. The one really competitive skill is the skill of being able to learn. It is the skill of being able not to give the right answer to questions about what you were taught in school, but to make the right response to situations that are outside the scope of what you were taught in school. *We need to produce people who know how to act when they're faced with situations for which they were not specifically prepared*.' (Papert, 1998; my emphasis)

Because we have no idea what is coming, we have to 'future-proof' our students, and the way to do that is with a broad and balanced curriculum. The current legal requirement for state schools in England is for:

> 'a balanced and broadly based curriculum which: (a) promotes the spiritual, moral, cultural, mental and physical development of pupils at the school and of society, and (b) prepares pupils at the school for the opportunities, responsibilities and experiences of later life.' (Education Act 2002 section 78)

This suggests that every school's curriculum should promote the intellectual, moral, spiritual, aesthetic, creative, emotional and physical development of the child. The traditional disciplines of language, arts, mathematics, science, history, geography should of course figure strongly, but the subjects that are sometimes called the creative arts (e.g. dance, drama, music, art) are just as important. Indeed, given the increasing capability of technology to do almost anything that can be reduced to routines, it may be that the greatest contributions to economic growth will in the future come from the creative arts.

But as well as the traditional 'school subjects' there are many other selections we could make from culture. Studying Latin is often claimed to train the mind (although there isn't much evidence that it does so) but couldn't chess do the same? The lack of appropriately qualified people in engineering is often lamented in the UK, but what are the precursors of university-level engineering in school? Physics and mathematics are important elements, but few schools have thought about what a course of study in engineering might look like (it's certainly not just design & technology). Other subjects that could be, but are generally not, taught during the period of compulsory schooling are geology, astronomy, law, psychology, sociology and politics.

In his book *The Element*, Ken Robinson points out that, too often, we focus on things that we need to do to find employment, or things we find we are good at, but these are not inherently fulfilling. Real personal fulfilment comes from finding what one's personal passions are – in other words, being in one's element.

Often people are dissuaded from following their passions because they are told to be practical, but the extraordinary thing about today's world is the way that advances in technology have revolutionised the world of work. This means, among other things, that today's passion may become the basis for tomorrow's career:

- For less than it cost to buy a laser printer 20 years ago, one can now buy a 3D printer, which will 'print' in plastic (i.e. make) anything you can design (with free software of course) in plastic. This may sound limited, but once you have prototyped your design at home in plastic, you can then send it to a company such as Shapeways, who will 3D print it in sandstone, glass, stainless steel or silver.

- Amazon's *Kindle Direct Publishing* allows writers to generate literary works, upload them to Amazon, specify in which countries they are to be made available, and specify a price at which the work is to be sold. After that, the author receives a payment from Amazon for each copy downloaded.

In a very real sense, therefore, the purpose of schooling should be to help each child find their element, and the only way to do that is to ensure that each child has a broad and balanced curriculum.

This will not be easy. As Sir Richard Livingstone, president of Corpus Christi College at the University of Oxford, wrote over 70 years ago:

> 'The test of a successful education is not the amount of knowledge that a pupil takes away from school, but his appetite to know and his capacity to learn. If the school sends out children with a desire for knowledge and some idea of how to acquire and use it, it will have done its work. Too many leave school with the appetite killed and the mind loaded with undigested lumps of information. The good schoolmaster is known by the number of valuable subjects that he declines to teach.' (Livingstone, 1941: p.28)

The important word in the quotation is 'valuable'. As teachers we desperately want to pass on to our students the benefits of our knowledge and wisdom, but if our curriculum is to be broad and balanced, we have to leave out important elements of the curriculum, in order to create more time for the even more important elements.

Rigorous

Any subject matter can be taught in a way that is faithful to the discipline or field from which it is drawn. Or it can be taught in a way that may

well teach students something, but does not advance, or in important ways hinders, the future development of their capability in that discipline or field. For example, if a class is studying a Shakespeare play, then watching a film of the play, and studying one or two scenes in detail, may well teach students something about the play, and it may even increase their grades on a GCSE English literature examination. But what is happening in the classroom is not faithful to the discipline of English literature. Similarly, in mathematics, a teacher might define a prime number as a number that can be divided without remainder only by one and itself. Such a definition works pretty well most of the time, but actually creates the impression that 1 is prime (since it can be divided without remainder by 1 and itself). It turns out that it is important, mathematically, that 1 is not a prime number (for then, any number can be expressed as the product of prime numbers in only one way, apart from the order of the numbers). A more rigorous definition of a prime number is one with exactly two factors. Most numbers fail to be prime because they have too many factors while 1 fails to be prime because it has too few. The second definition is more faithful to the discipline of mathematics than the first.

It is often assumed that the subject disciplines in our schools – English, mathematics, science, history, geography and so on – are arbitrary. It is assumed that we have these subjects rather than others (e.g. the seven traditional 'liberal arts': grammar, logic, rhetoric, arithmetic, geometry, astronomy and music) because of some random decisions taken in the past. However, this is far from the case. The traditional school disciplines represent powerful – and qualitatively different – ways of thinking about the world.

The word 'discipline' is important here because it connotes both a subject, and the commitment that is needed to acquire the ways of thinking emphasised by the subject. For example, on a cold day, most

people would explain their perception of the effect of the wind as being caused by the cold wind coming through their clothes, while anyone who has been trained as a physicist would explain this as heat being carried away from the body. Both explanations are, in some sense, correct, but the physicist's explanation is more powerful, in that thinking about heat, rather than cold, tends to produce more accurate answers to similar questions. (It is also more likely to support practical application of the information). The important point here is that such thinking does not develop naturally – if it did there would be no need to teach physics in our schools. Rather it is the result of becoming enculturated into the subject, and this requires hard work.

To be rigorous, therefore, a curriculum needs to develop disciplinary habits of mind – powerful ways of thinking that are developed through sustained engagement with the discipline. Examples are inverse operations in mathematics, cause and effect in science, structure and agency in sociology, provenance and context in history, and central tendency and dispersion in statistics. These are important and powerful tools for thinking, and can be developed only through sustained engagement with the discipline. Without sound disciplinary foundations, interdisciplinary work becomes trivialised and watered down. Effective interdisciplinary work is multi-disciplinary, drawing on the strengths, habits of mind, and tools that each discipline contributes.

Another common, but mistaken, assumption about the traditional subject disciplines is that they can be replaced with, or at the very least are less important than, so-called '21st century skills'.

At the outset it is worth pointing out that the description '21st century skills' is misleading since none of the skills usually discussed under this label are new. They are capabilities that have always been important. There is some merit in the argument that changes in the

world of work in particular mean that the capabilities that used to be demanded of a small number of workers at the top of management hierarchies are increasingly required of all workers. But in general most of the arguments about the novelty of 21st century skills are rather unconvincing.

There is also no agreed definition of what 21st century skills are. The National Academies of Sciences in the US convened a committee to review the evidence about what kinds of capabilities would be needed for life and work in the 21st century (Pellgrino & Hilton, 2012). It concluded that they could be grouped into three broad areas: cognitive competences, intrapersonal competences, and interpersonal competences. The cognitive competences include cognitive processes and strategies (e.g. problem-solving), knowledge, and creativity. The intrapersonal competences are what psychologists sometimes call dispositions: intellectual openness, work ethic and conscientiousness, and self-monitoring and self-evaluation. The interpersonal competences are teamwork and collaboration, and leadership.

Obviously all of these aspects of achievement are important. It is hard to imagine anyone arguing that any of the competences identified by Pellegrino and Hilton are not important, or that we should not seek to develop these competences in young people. However, by describing these competences as skills, it is difficult to avoid slipping into an assumption that they are in some way generalisable or transferable.

The word skill is routinely used to describe an ability to do something well as the result of training and practice, or, less commonly, as a result of experience. This is fine when we talk about skill in playing darts, bouncing a football on one's head, spelling, or computation. The problem comes when we talk about skills as if they are in some way generic, or transferable, such as when we say 'problem-solving

skills', 'critical thinking skills' or 'communication skills'. A huge amount of research on skill acquisition has found that the skills developed by training and practice are very rarely generalised to other areas, and are, in fact, very closely related to the specific training (see, e.g., Willingham, 2009; Owen et al., 2010).

It is certainly unhelpful, and probably wrong, therefore, to talk about 'critical thinking skills'. Critical thinking is an important part of most disciplines, and if you ask disciplinary experts to describe what they mean by critical thinking, you may well find considerable similarities in the responses of mathematicians and historians. The temptation is then to think that they are describing the same thing, but they are not.

Critical thinking is not one thing; it is an umbrella term to describe similar, but different, processes in different disciplines. To take a concrete example, one important aspect of critical thinking in mathematics is to be able to check that each step in a mathematical argument follows logically from the previous one. The danger is that if one divides both sides of an equation by zero, the result is meaningless, and so mathematics students, when they are verifying a mathematical argument, check that there has not been a division by zero. This sounds straightforward, but there are traps for the unwary. For example, if both sides of an equation have been divided by $x - y$ then this is fine as long as x and y are not equal. But if x and y are equal, then dividing both sides of an equation by $x - y$ has divided the equation by zero, so everything that follows is nonsense. The careful mathematician therefore makes sure to note that when dividing both sides of the equation by $x - y$ what follows is true only when x and y are not equal. The important point here is that the pitfalls associated with dividing equations by zero are learned only in mathematics classrooms. No amount of training students to think critically in history will make them any better at critical thinking in mathematics.

> No amount of training students to think critically in history will make them any better at critical thinking in mathematics.

The same is true for creativity. Creativity is not a single thing, but in fact a whole collection of similar, but different, processes (Lehrer, 2012). Creativity in mathematics is not the same as creativity in visual art. If a student decides to be creative in mathematics by deciding that 2 + 2 = 3, that is not being creative, it is just silly, since the student is no longer doing mathematics. That is not to say that there might be interesting ideas to be explored with such an approach, but it is unlikely to be rigorous. As Csikszentmihalyi (1996) has pointed out, creativity involves being at the edge of a field, but still being within it.

Similar arguments can be made for other '21st century skills' such as problem-solving, communication and learning how to learn. There is some evidence that students who learn to work well with others in one setting may be more effective doing so in other settings, so some transfer is definitely possible. However, the really important message from the research in this area is that if you want students to be creative in mathematics, you have to teach this in mathematics classrooms. If you want students to think critically in history, you have to teach this in history.

One consequence of this is that it is a mistake to talk about 'creative subjects' for in truth creativity is a part of all subjects, as is critical thinking, problem-solving, collaboration, communication and learning how to learn. All school subjects can be taught in what Guy Claxton calls an epistemically narrow way or an epistemically broad way (Claxton, 2013). We can teach history as if it is about facts and dates,

or we can teach history as an epistemic apprenticeship into the discipline of history involving facts and dates *and* understanding bias in historical sources *and* chronology *and* cause and effect. Similarly, we can teach mathematics as if its primary goal is speed in arithmetical computation, or we can teach it in a way that recognises that knowing number facts is important, but knowing also about patterns in mathematics, such as the product of two odd numbers is always odd, so 7 x 9 cannot be 62, but that, for example, it will be one less than 8 x 8.

The '21st century skills' are therefore useful, but not as skills that can be developed in one subject and applied in another. Their greatest value probably lies in their use as tools for auditing the breadth of the curriculum being offered in each discipline or subject. So we should look at the science curriculum and check that it is developing creativity, and critical thinking and communication and collaboration and problem-solving and learning how to learn. And we should apply the same checklist to our PE curriculum, and our RE curriculum and so on. That is the way to ensure a truly rigorous curriculum.

Coherent

The requirement for a rigorous curriculum described in the previous section is very much focused on the internal logic of each discipline or subject. But for the educational experiences of young people to be meaningful, it is also necessary to ensure that what they experience in the different activities they engage in is coherent. This is important because unless explicit connections are made between the different experiences young people encounter in school, they are likely to see them as unconnected. Students often see coordinates in mathematics as unrelated to map references in geography, when the underlying ideas are identical. This often entails concessions and compromises. For example, the mathematics teachers may feel that equations and graphs are best taught in year 9, but if the science teachers need to

use equations and graphs in year 8, there is a problem. Of course the science teachers could teach equations and graphs themselves, but the danger then is that this is done in a way that differs slightly from the approach taken by the mathematics teachers. For example, the mathematics teachers might use a functional approach to graphs, such as x->4x + 3 while the science teachers use equations, such as y = 4x + 3. Unless the connections are explicitly made for the students, they are likely to see graphs in science as different from graphs in mathematics.

The connections between different aspects of the curriculum are especially important in the development of reading. In the early years of primary school, children acquire the skills of decoding text, but once the basic decoding skills are acquired, reading is much more about knowing what is being described rather than being able to recognise words. To illustrate this, E.D. Hirsch gives the following example of a multiple-choice comprehension question.

> *'A manifold, contained in an intuition which I call mine, is represented, by means of the synthesis of the understanding, as belonging to the necessary unity of self-consciousness; and this is effected by means of the category.*
>
> **What is the main idea of this passage?**
>
> 1. Without a manifold, one cannot call an intuition 'mine.'
> 2. Intuition must precede understanding.
> 3. Intuition must occur through a category.
> 4. Self-consciousness is necessary to understanding.'

Most adults will have little difficulty with the words in the paragraph (which is taken from Immanuel Kant's *Critique of pure reason*), with

the possible exception of the word 'manifold', which is used by Kant to describe a collection of elements of sensation. But even being told this doesn't help much. The problem is not with decoding, but with forming a mental representation of what is being discussed. Unless one understands the point that Kant was trying to make here – that intuitions occur through categories – one cannot even begin to make sense of the passage.

E.D. Hirsch describes the situation like this:

> 'Comprehension depends on constructing a mental model that makes the elements fall into place and, equally important, enables the listener or reader to supply essential information that is not explicitly stated. In language use, there is always a great deal that is left unsaid and must be inferred. This means that communication depends on both sides, writer and reader, sharing a basis of unspoken knowledge. This large dimension of tacit knowledge is precisely what is not being taught adequately in our schools.' (Hirsch, 2009: p.15)

As Hollis Scarborough (2001) points out, learning to read is not just learning to recognise words through sight recognition, decoding, and phonemic awareness. It also requires comprehending language, which involves vocabulary, verbal reasoning, literacy knowledge (knowing about print concepts and genres), knowledge of language structure (syntax, grammar, etc.), and background knowledge of the subject of the text. As the basic word recognition processes become increasingly automatic, the language comprehension processes become increasingly strategic, relying on background knowledge.

This is why a coherent curriculum is so important. Our short-term working memory is limited, and cannot be increased, but background

knowledge enables us to make more effective use of whatever short-term working memory we have. And that is why E.D. Hirsch concludes that 'content is skill, skill content'. (op cit. p.210)

Vertically integrated

A curriculum could be balanced, rigorous (in that it was faithful to the disciplines or subjects on which it draws), coherent (in that the totality of experiences mutually reinforce each other) and yet might still be inadequate because it failed to promote progression in learning. In other words, it needs to be clear how material taught at one point in time builds on materials taught earlier, and feeds in to what is to be taught later. Every curriculum needs to have a clear model of what it is that gets better when someone 'gets better' at a discipline or subject.

In the first national curriculum for science in England, for example, there was a particularly clear model of progression in the understanding of light (Black, 1995).

- Know that light comes from different sources
- Know that light passes through some materials and not others, and that when it does not, shadows may be formed
- Know that light can be made to change direction, and that shiny surfaces can form images
- Know that light travels in straight lines, and this can be used to explain the formation of shadows
- Understand how light is reflected
- Understand how prisms and lenses refract and disperse light
- Be able to describe how simple optical devices work
- Understand refraction as an effect of different velocities in different media

- Understand the processes of dispersion, interference, diffraction and polarisation of light.

One can quibble with details of this progression, but the important thing is that such a framework provides a clear plan for the development of one aspect of scientific thinking over a period of at least ten years.

The problem with levels of achievement, at least as specified in the national curriculum, is that they were too often determined by the requirement that the levels should be specified so that students achieve one level every two years on average. The steps in development are rarely so neatly spaced, so the removal of levels from the national curriculum allows schools to decide on curricular progressions that suit their students and their circumstances. Obviously, the logic of the subject matter should be the most important determinant of the model of progression, but many schools have found the SOLO taxonomy (Biggs & Collis, 1982) helpful in deciding how hard something might be (so that something can be placed into the curriculum at an appropriate level) and also what might come before, or next.

At the detail level of classroom practice, in designing teaching to promote progression, there is no substitute for teachers planning lessons collaboratively, as is practised in lesson study in Japan (Lewis, 2002; Fernandez & Yoshida, 2004). What is particularly intriguing about lesson study, as practised in Japan, is the extraordinary amount of time teachers spend discussing what seem to be relatively minor issues. For example, in the UK, mathematics teachers tend to teach the area of a triangle before teaching the area of a parallelogram. However, as a result of extensive investigation and research, Japanese teachers have determined that it makes much more sense to teach the area of a parallelogram before the area of a triangle. Those not interested in the reason can skip to the next paragraph, but the crucial observation

is: two versions of the same triangle can always be fitted to give a parallelogram; but only when the triangle is a right-angled triangle can two versions of the triangle be fitted to make a rectangle.

Careful sequencing of topics leads to clearer connections between different topics, fewer things for students to remember, and therefore more effective learning. But this kind of careful sequencing takes planning, and is best done as a collaborative venture between teachers.

In devising curricular progressions, it is important to realise that very few curricular sequences are universal, even in a subject as linear as mathematics. It would not make sense to attempt to teach children to multiply before they can add, but while it might be assumed that one should teach multiplication before division, in fact the situation is a little more complex. It turns out that although multiplication is computationally more straightforward than division (you have to be able to multiply in order to be able to divide), conceptually, division is more straightforward than multiplication. This was demonstrated in the Concepts in Secondary Mathematics and Science (CSMS) research (Hart, 1981). One innovative aspect of the research was that students were asked to construct stories concerning arithmetic facts. The researchers found that many students could construct a story for a division such as $12 \div 3 = 4$ (e.g. 'there were 12 sweets shared between three people so they got four each'). But fewer could do so for a multiplication such as $3 \times 4 = 12$ (they said things like 'Jane had three sweets and John had four sweets, so they timesed them to get 12 sweets'). In a computational approach to multiplication and division, multiplication should precede division, but in a conceptual approach, it may make more sense to start with division. The sequence in which we teach things matters, and requires careful thought.

In other less linear subjects, there is even greater freedom for us to teach things in the sequence that makes most sense. I do not mean to

suggest that 'anything goes'. Rather teachers have both considerable freedom, and considerable responsibility, to sequence the curriculum. However, this must be done in a way that is accountable both to their students and their needs, and to the discipline or subject (Michaels et al., 2008). A 'grand narrative' in which we start with the Stone Age, and work through to the Romans, the Vikings and so on, may be attractive to some politicians as a basis for a history curriculum, but it does not make sense psychologically, nor historically. It does not make sense in terms of what we know about how young children develop the ability to think historically, and it does not adequately reflect what it is that gets better when students get better at history. As with so much else to do with curriculum design, curricular sequencing is a creative process, and cannot be reduced to a set of procedures.

One issue that often comes up in the construction of curricula that are designed to promote progression in learning is the idea of the spiral curriculum. The phrase is often used to justify teaching students material that might come in useful later on. Too frequently, the result is wasteful, ineffective, or both. Either students are exposed to material that is beyond their grasp but which they revisit periodically until they do (not so much a spiral curriculum as a circular one). Or, the material is watered down until it is accessible to the students, but it then bears little relationship to the discipline or subject. For this reason, it is useful to review what Jerome Bruner, who invented the term, said about it.

> 'If one respects the ways of thought of the growing child, if one is courteous enough to translate material into his logical forms and challenging enough to tempt him in advance, then it is possible to introduce him at an early age to the ideas and styles that in later life make an educated man. We might ask, as a criterion for any subject taught in primary school, whether, when fully developed, it is worth an adult's knowing, *and whether having known it as a child makes a person a better adult*. If the answer to both

questions is negative or ambiguous, then the matter is cluttering the curriculum.' (Bruner, 1960: p.52; my emphasis)

The condition that Bruner imposes – that material can be justified only if not having learned it as a child, rather than later, disadvantages the adult – would rule out most of what is today justified by appeal to the spiral curriculum. Indeed, one of the interesting differences between the curricula of high-performing countries and those that do less well in international comparisons is the high-performing countries tend to teach the same material in fewer years (Schmidt *et al*., 1997). They wait until the students are ready for the material, and then teach it properly. This brings us on to the need for the curriculum to be appropriate.

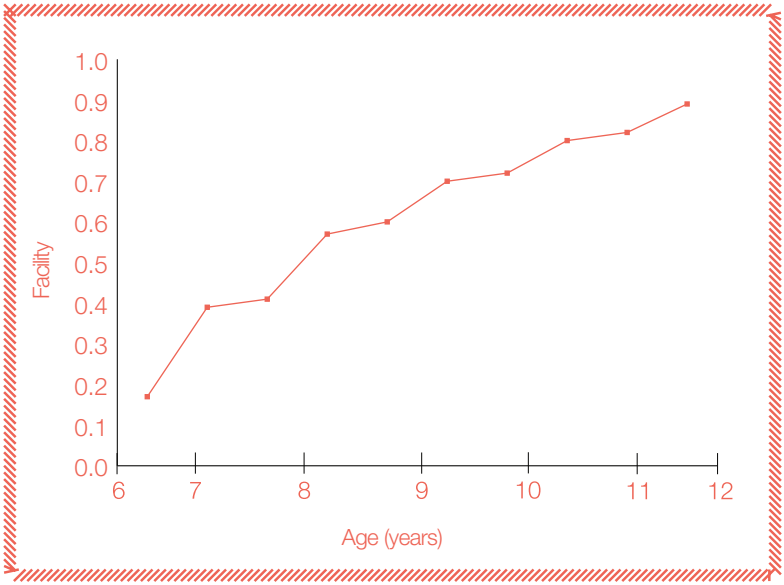
> High-performing countries… wait until the students are ready for the material, and then teach it properly.

Appropriate

The rate at which children learn varies to quite an extraordinary degree. This is illustrated by Figure 1, which shows the proportion of children of different ages participating in the Leverhulme Numeracy Research Programme able to correctly add 860 and 570 using pencil and paper. Around 15% of students are able to do this early in year 2, but not until the end of year 6 does the proportion of students able to answer this question correctly reach 90%. Since the proportion of students able to answer this question correctly increases by 75% in five years, the annual increase in the proportion of students able to do this is just 15%. Or, to put it another way, in a class of 30 students, four or five students are likely to learn this in any given year, despite the fact that teachers are teaching this every single year.

Many schools respond to this large variation in student achievement by grouping students by ability, which is generally called 'streaming' where the students are in the same general ability groups for all subjects, and 'setting' where the students are grouped differently for different subjects, depending on their achievement in that subject. There is a large literature on the effects of grouping students by ability that suggests that on average it produces gains for the highest achievers at the expense of losses for lower achievers. Since the losses for the lower achievers tend to be greater than the gains for higher achievers, the net effect of grouping students by ability is to slightly reduce average achievement, but to increase the range of achievement in a year group. What is less well understood is how the curricula experienced by students in different sets differ.

Figure 1: Increase in proportion of students able to add 860 to 570, by age



Such evidence as there is suggests that students in the lower sets receive a curriculum that is less rich, and, in Guy Claxton's terms, epistemically narrow (Boaler, Wiliam & Brown, 2000). The objective is therefore to provide an appropriate level of challenge for students while also taking into account what is known about the way in which students learn, so as to avoid making unreasonable demands on students.

In recent years, a number of schools have addressed this issue through curricula based on 'stage, not age'. Students are grouped with students of similar achievement irrespective of their age. However, before grouping students by stage rather than age, and determining what curricula are appropriate for different students, it is important to understand that the dimensions of progression in a curriculum can be different in different subjects, or even in different aspects of the same subject.

For example, one way of defining ability in science is in terms of scientific reasoning, perhaps best exemplified by the science reasoning tasks developed by Shayer and Adey (1981). Achievement using this definition is less closely tied to age and curriculum exposure, and more closely related to measures of general reasoning (Shayer, Kücheman & Wylam, 1976; Shayer & Wylam, 1978). In other words, the science reasoning tasks are not strongly related to quality of teaching received, or maturation.

In contrast, when science is defined in terms of knowledge of facts that are taught in school, then opportunity to learn will be the most important factor – those students who have been taught the facts will know them, or at least have the opportunity to know them, while those who have not been taught will, in all probability, not. A test that assesses these skills is likely to be highly influenced by the amount and quality of teaching.

A third case might arise in the discussion of ethical and moral dimensions of science, where maturity, rather than general intelligence or curriculum exposure, might be the most important factor. Here it might well be that a student's performance depends relatively little on the amount or quality of teaching, or on general intelligence, but is highly sensitive to maturation.

A 'stage not age' approach is therefore not likely to be equally appropriate to all aspects of the curriculum for a particular subject.

Many people have assumed that the freedom of schools to organise programmes of study has been reduced in the government's latest proposals for the national curriculum for England. The current drafts set out the programmes of study for mathematics and science separately for each year in key stages 1 and 2, while that for English is specified year by year in key stage 1 and in two year blocks for key stage 2. However, it is important to realise that the statutory framework remains that laid out in the 1988 Education Reform Act, which allows the secretary of state for education to specify programmes of study for each national curriculum subject only in terms of what has to be taught during a key stage. Schools may find the detailed sequencing provided a helpful guide to their own planning, but as long as the material specified in the programmes of study for years 1 and 2 is taught by the end of year 2, and that specified for years 3, 4, 5 and 6 is taught by the end of year 6, the school is satisfying its legal obligations.

Whether the national curriculum is best designed on a year by year basis, or in terms of key stages, or blocks of years, is a complex issue. When the curriculum is set out year by year, coherence across subjects is more straightforward, and the indicated material provides an early check on whether students are making the necessary progress, helping the school function as a high-reliability organisation (Reynolds

et al., 2001). On the other hand, year-by-year specification reduces the freedom for teachers to plan curriculum sequences that meet the needs of their students. In addition, year-by-year specification tends to result in the curriculum being spelled out in fine detail, leading to atomisation.

In contrast specifying the curriculum in terms of what has to be taught in a key stage creates freedom for flexible sequences, and also allows a greater focus on 'big ideas' (see next sub-section). The danger here is that cross-curricular links are left more to chance, and the flexibility works both ways – teachers can defer teaching more problematic aspects of the curriculum with the result that it all piles up in the final year of the key stage. As with all the other principles discussed in this booklet, there are no easy answers.

Focused

One of the most common complaints that teachers make about the curriculum they are teaching is that it is too full. Especially in science, but also in other subjects, there is a great deal of material to be taught, and this often results in a curriculum that is, in William Schmidt's memorable phrase, 'a mile wide and an inch deep' (Schmidt, McKnight, & Raizen, 1997). However, the same teachers who complain about an overfull curriculum also resist the removal of any topics from the curriculum – because they are seen as important. This is why the quotation from Sir Richard Livingston discussed earlier is significant. One cannot make a curriculum better by removing unimportant material because there is no unimportant material – it's all good. Generally, the only way to improve a curriculum is to leave out important material so that the teacher and the students can spend more time on *more* important material – 'the good schoolmaster is known by the number of valuable subjects that he declines to teach.'

One of the key steps in designing a curriculum, therefore, is to be clear about what the 'big ideas' of the subject are. This is, in general, a very

difficult task, requiring profound subject knowledge and substantial teaching experience. But the difficult discussions about what are the most important ideas in a subject are essential to undertake if the resulting curriculum is to be manageable.

As noted above, the science curriculum is especially full of content (the original version of the national curriculum for science had 407 statements of attainment). So it is noteworthy that an international group of science education specialists managed to come up with a list of just ten big ideas of science, and a further four big ideas about science (Harlen et al., 2010):

Big ideas of science

1. All material in the universe is made of very small particles.
2. Objects can affect other objects at a distance.
3. Changing the movement of an object requires a net force acting on it.
4. The total amount of energy in the universe is always the same but energy can be transformed when things change or are made to happen.
5. The composition of the Earth and its atmosphere and the processes occurring within them shape the earth's climate.
6. The solar system is a very small part of one of millions of galaxies in the universe.
7. Organisms are organised on a cellular basis.
8. Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms.
9. Genetic information is passed from one generation of organisms to another.
10. The diversity of organisms, living and extinct, is the result of evolution.

Big ideas about science

1. Science assumes that for every effect there is one or more causes.
2. Scientific explanations, theories and models are those that best fit the facts known at a particular time.
3. The knowledge produced by science is used in some technologies to create products to serve human ends.
4. Applications of science often have ethical, social, economic and political implications.

One could of course quibble about the particular selection made, but the important point about such a list is that it provides a structure for the organisation of the curriculum. Topics and activities are then selected only if they contribute to developing students' understanding of these 'big ideas'. Such a set of big ideas enables teachers and students to see the connectedness of the whole curriculum – trunk and branches if you will, rather than a disorganised collection of twigs and pine needles.

It is also important that the big ideas need not always be stated as outcomes. Sometimes, they are just things that we want young people to experience. The idea that a curriculum could be specified in terms of both outcomes and experiences was an explicit feature of the Scottish Curriculum for Excellence, as this statement about the expectations for dance illustrates:

> 'Through dance, learners have rich opportunities to be creative and to experience inspiration and enjoyment. Creating and performing will be the core activities for all learners, and taking part in dance contributes to their physical education and physical activity. Learners develop their technical skills and the quality of their movement, and use their imagination and skills to create and choreograph dance sequences. They further develop their knowledge and understanding and their capacity to enjoy dance through evaluating

performances and commenting on their work and the work of others.' (Scottish Government, 2007 p.5)

Relevant

The foregoing principles are essential to the design of a high-quality curriculum, but none of these matter very much if the resulting curriculum is not relevant to the students for whom it is intended, and this is where teacher creativity is most important. What is in the intended curriculum – the lists of things that we want young people to learn – is rarely, at face value, relevant to students. What makes curriculum relevant is the way that teachers *connect* valued outcomes to the students in front of them. Of course some students are personally interested in certain aspects of the curriculum, but most are not, and it is the skill of the teacher that creates what Hidi and Harackiewicz (2000) call *situational interest* – the extraordinary way that good teachers get students interested in things they never knew they were interested in. Getting agreement on what it is that we want young people to learn is not easy, but it is relatively trivial compared to the challenge of teaching these ideas in a way that is engaging, interesting, and motivating for students.

One idea that appears to be useful in steering a course between the interests and wishes of the students on the one hand, and the principles of curriculum discussed above on the other, is that of *informed choice* in respect of pedagogy and curriculum. That is to say from the earliest ages, students should have a say in *how* they learn, and, as they get older, also in *what* they learn. The curriculum should provide opportunities for students to specialise – to pursue their interests in greater depth than would be required of all students. But since more time on subjects of interest will, inevitably, mean less time for others, students need to know enough about the subjects they are dropping for their decision to be an informed one.

> From the earliest ages, students should have a say in *how* they learn, and, as they get older, also in *what* they learn.

To make an informed choice about what to learn, students will need to consider a range of factors. Perhaps the most important is the nature of the subject itself. But before students can form an accurate view of the nature of the subject, they have to experience the subject, which places a responsibility on the school to ensure that the students' experiences of the subject are authentic. If as a result of their classroom experiences, students think that geography is about learning the names of 'capes and bays' or they think mathematics is about doing arithmetic quickly, then they have not experienced what the subjects are really about, and so any choice to stop studying the subject would not be informed.

For certain subjects, there may be 'sensitive periods' where studying the subject at a particular age leads to significantly greater progress than the same effort would produce at a different age, although the evidence for these is much weaker than most people imagine. In learning modern languages, for example, there certainly are sensitive periods. Unless one learns the sounds of a language before adolescence, it is highly unlikely that one will ever speak that language like a native (but then, who needs to speak a language like a native apart from spies?). There is a sensitive period for learning the syntax and grammar of a language, but this sensitive period appears to extend to at least the age of 25. For learning the vocabulary of a language, there appears to be no sensitive period. Very few of the claims about sensitive periods in learning are based on evidence, and most seem to be attempts to justify the kinds of spiral curriculum criticised earlier.

It is also important to bear in mind that in the English education system, students make choices about specialisation at a time when they are actively engaged in negotiating their social identities. Students who make decisions not to pursue science because their only images of scientists are nerds with pen protectors and lab coats are again not making informed choices.

Students also need to be aware that certain subjects act as 'critical filters' for entry into other fields. In choosing their A-levels, many students are unaware, for example, that if you want to train as a doctor, biology is not necessary, but chemistry is. And mathematics operates rather like a leaky pipe; once you stop studying it, it is hard to go back.

Finally, financial rewards may be important to some students, so they need to know whether certain decisions are likely to have significant consequences for future income.

The seven principles in combination

Readers who have reached this point will probably be convinced that no curriculum could ever, at the same time, be balanced, rigorous, coherent, vertically integrated, appropriate, focused, and relevant. And of course they would be right. The seven principles are not really goals or things we should aim for; the principles are always in tension, and often in direct conflict. The purpose of the principles is to provide a set of ideas with which schools can examine their curriculum, see where the trade-offs are being made, and check that these are trade-offs with which the school is comfortable.

Chapter 4
Applying the principles

If a school is going to use a set of principles to guide the development of its curriculum, an important first step is to make sure that they are the right principles. As a preparatory activity, therefore, it may be useful for teachers to discuss whether the seven principles described above are the right principles for the school. Once teachers have been introduced to the principles, either by reading this booklet or by having them presented to them (a set of PowerPoint slides that can be used for this purpose can be found at www.dylanwiliam.org) small groups can decide whether they want to amend the list. To structure these discussions, groups could be asked:

- Are any important principles missing?
- Are any of the principles less important than the others?
- Could some of the principles be combined?

The agreed set of principles then provides a framework for evaluating the school curriculum as it develops. As teachers work with the

framework and become more familiar with it, their understanding of the principles may change, so it may be worth reviewing the principles each year.

Once the principles have been agreed, an obvious next step is to start thinking about what should be in the curriculum. Because they are immersed in their own subjects, secondary school teachers often find it difficult to think more broadly about the curriculum, so it can be helpful to ask them what would they want their own children to learn in school?

It is a good idea to include teaching assistants and other support staff in these discussions, since their perspectives often differ from teachers'. Further valuable insights can be gained by involving students, governors, parents, and key local stakeholders. For example, one school undertaking such an exercise found that many students thought that first aid should be a part of the curriculum, even though none of the teachers had thought to mention this.

Of course such an open-ended activity is likely to generate far more ideas than could be accommodated in any school curriculum, so it will be necessary to find ways of combining and prioritising the potential elements. This is probably best done by a small group of individuals – ideally representing a range of different perspectives (i.e. not just members of the senior leadership team), and also including at least one parent and one governor.

The danger with allowing a small group to synthesise such a large amount of data is that transparency is lost. So to preserve the openness of the process, it is a good idea to make a record of all the ideas generated for the curriculum and for this record to be available to all stakeholders.

Once the group has produced its priorities for the curriculum, these can be debated further. Of course, consensus is highly unlikely in such a complex and contested set of issues. However, there is considerable evidence from decision theory that the right kinds of process for making decisions will lead to people accepting the outcomes, even if the decision is not what they would have chosen. In particular, if people think they have been given a chance to 'have their say', they are likely to be willing to move forward on an agreed basis (Heath & Heath, 2013). As Lovallo and Sibony (2010) note, 'superb analysis is useless unless the decision process gives it a fair hearing' (p.6).

As with so many of the issues about the curriculum, how the priorities, once agreed, are taken forward in the school is not something that can be laid out like a recipe. For a start, deciding whether themes such as global citizenship are given their own timetable slot or are infused into the teaching of other subjects cannot be done in the abstract – it depends on the school, the students, and the current skills of the teachers. For some schools, at a certain point in time, a separate timetable slot may be the most effective way of ensuring this issue is given its due importance. For other schools, and even for the same school at a different time, it may be more effective to have this issue being a shared responsibility of all teachers.

More importantly, since finding innovative ways of using the curriculum time available is essentially a creative process, any attempt to mandate this is likely to be unsuccessful. Teachers need time to experiment and to explore.

> Finding innovative ways of using the curriculum time available is essentially a creative process. Teachers need time to experiment and to explore.

Finally, it should be recognised that curriculum development is not something that is done periodically. It is part of every school's regular cycle of improvement and renewal. That said, it is also important that the process of developing curriculum is not allowed to drag on, being debated in committee after committee. As Lawrence Stenhouse suggested, the real value of a curriculum is as an educational proposal laid out in sufficient detail that it can be scrutinised, and then put into practice by teachers and students.

Ultimately, the test of any curriculum is the experiences of young people in classrooms. But the ideas in this booklet, and specifically the seven principles of curriculum design described above, may sharpen the process of debate and discussion so that schools can more quickly develop curricula that prepare young people for a world that no-one can imagine.

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