

# **How a Knowledge-Based Curriculum Could Transform Scottish Education**

Lindsay Paterson  
Bruce Roberston

## **About Reform Scotland**

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## **About Lindsay Paterson**

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Lindsay Paterson is professor emeritus of education policy in the School of Social and Political Science at Edinburgh University. He has written and taught on education, social mobility, and politics. His most recent book is *Scottish Education and Society since 1945* (Edinburgh University Press, 2023, pbk 2025). He was elected a Fellow of the Royal Society of Edinburgh in 2004, and a Fellow of the British Academy in 2013.

## **About Bruce Robertson**

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Bruce Robertson is the Director of Next Level Educational, which specialises in professional development for teachers and school leaders. His books include 'The Teaching Delusion' trilogy and 'Power Up Your Pedagogy: The Illustrated Handbook of Teaching', published by John Catt Educational. Of Power Up Your Pedagogy, Professor Rob Coe of Evidence Based Education says: 'To all teachers I would say: study this book, learn from it and act on it'. As headteacher, Bruce's leadership of Berwickshire High School from 2020-24 has been instrumental in turning around a school rated 'weak' and 'unsatisfactory' in an HMIE inspection, to one that is now widely recognised as sector-leading in its approaches to teaching & learning improvement, ethos, and staff professional development. As a consultant and trainer, Bruce is widely praised for his passion, clarity and the practicality of his messages.

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## **Foreword**

The performance of Scotland's schools is, with good reason, a cause of national concern. Sadly, we currently lack the data that would tell us exactly what is happening inside the system – both good and bad - but the data that we do have does not tell a happy story.

The most recent PISA figures were particularly alarming – Scotland appears to have entered a long decline when it comes to pupil performance in key areas such as reading, maths and science. We are lagging behind England, where consistency in education reform has been pursued by governments of differing stripes over recent decades.

This paper, by Professor Lindsay Paterson and Bruce Robertson, rector of Berwickshire High School, examines the nuts and bolts behind a successful education system. It stresses the importance of a knowledge-based curriculum, and explains how that might be put into practice. And it sets out how the teaching of knowledge and skills need not amount to a choice between one or the other, but can encompass both: “skills are knowledge in action”. As the results from Berwickshire High School show, Robertson's application of such an approach has led to dramatic improvements in pupil performance.

As it stands, the Curriculum for Excellence is not serving Scotland's teachers, pupils or parents as well as it should or could. If we are to thrive as a society in the economy of the future, amid increasingly fierce global competition, we must educate our children in ways that prepare them for the world they will inherit.

This paper suggests a practical, science-based approach that would deliver intellectually rigorous schooling for the many. With the 2026 Holyrood election looming, we hope policymakers pay close attention to its findings, and reflect them in their own proposals for improving Scotland's schools. We will be watching.

**Chris Deerin**  
**Director**  
**Reform Scotland**

## Introduction

This paper explains why sound education depends on instilling systematic knowledge, and shows how that principle may be implemented in practice. There is a widespread assumption in public debate about Scottish education that knowledge and skills are opposed to each other. The claim, often made, is that schools have traditionally paid too much attention to knowledge, neglecting the skills which people will need as adults – skills for everyday life, or for work, or for citizenship. This view is mistaken. Knowledge and skills are complementary. Skills are knowledge in action. Knowledge depends on skills to have an effect in the world. The type of curriculum which is outlined here may best be described as knowledge-based and skills-oriented. The paper explains what that means in practice.

The core of the paper is an account of the experience of Berwickshire High School where Bruce Robertson became rector in August 2020. That part of the paper – the third section – was drafted by Bruce. Although other schools might seek to emulate Berwickshire’s experiences directly, adapting it to their own conditions, we think that there needs to be national leadership based on systematic evidence to enable this to happen more widely. So the second and fourth sections explore how international research on a knowledge-based curriculum may inform the practice of teaching and of school leadership. The second section is a summary of the conclusions of that research. The concluding fourth section relates the research to the experience in Berwickshire High School; we also briefly reflect in that section on the implications for the curriculum in primary schools. These sections were drafted by Lindsay. All the sections have been revised after discussion between the authors.

So the paper is more than a reiteration of general debates about the place of knowledge and skills, and about the role of teachers and of educational policy in developing these. These general ideas have been explained by many other writers, in many other educational contexts. The more important aim here is the practical one. How can a knowledge-based curriculum be made to work in Scottish secondary schools in the context of Curriculum for Excellence? We hope that the grounding of our ideas in the recent development of one Scottish school can help to show that the theoretical ideas about knowledge and learning are sensible, practicable, and successful.

## How people learn

Knowledge is more than rote-learning a list of facts. Facts are indeed important. Rote-learning sometimes is, too. But none of this matters unless it is placed in a structure. Consider an example from Scotland's Curriculum for Excellence. In English, students in the first three years of secondary school are expected to learn about literary genres, such as fictional stories, objective reports, persuasive advocacy, and so on.<sup>1</sup> Some of the differences could be learnt as lists of typical examples, such as *The Great Gatsby*, a scientific report, a political speech. But the differences go beyond lists of this kind. What matters are principles – the essential features of each genre.

These organising principles are often called a schema.<sup>2</sup> Schemas are the sets of ideas that we use to sort facts into a comprehensible pattern. Learning is developing an understanding of schemas. Knowledge is embedding that understanding in our memory.

That's difficult because human memory is of two kinds, one of which – working memory – has very limited scope.<sup>3</sup> Most people can retain at most about five things in working memory, and for no longer than about 30 seconds. The problem is that working memory is the gatekeeper to long-term memory, which is where we store things we have learnt. Long-term memory is probably infinitely large. But the only way into it is the narrow and ephemeral path of working memory.<sup>4</sup>

There are many ways of moving things from working memory to long-term memory. One is actually rote learning of facts. For example, learning multiplication tables at a young age can instil them in long-term memory for our whole lives. That can only be achieved by rote learning. Rote-learning can be made to be quite enjoyable – for example, doing it to music, or rehearsing it as part of games. The same might be said of other foundational schemas, notably spelling and grammatical rules. These too may be made more palatable. But, in the end, it is an unavoidable chore. Pretending that some aspects of basic learning are not hard work and mundane does not serve children well. Only when these basic facts and skills have been learnt can later learning become fluent and thus fulfilling.

This is important because of another useful feature of long-term memory. Old facts that are recalled from long-term memory into working memory do not crowd out any

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<sup>1</sup> ENG 3-19a in *Literacy and English: Experiences and Outcomes*, <https://education.gov.scot/curriculum-for-excellence/curriculum-for-excellence-documents/experiences-and-outcomes/>.

<sup>2</sup> Eggen, P. and Schellenberg, S. (2010), 'Human memory and the new science of learning', in M.S. Khine and I.M. Saleh (eds), *The New Science of Learning*, Springer, New York, 79-107.

<sup>3</sup> Sweller, J. (2011), 'Cognitive load theory', in J.P. Mestre, B.H. Ross (eds), *Psychology of Learning and Motivation Volume 55*, Amsterdam: Elsevier, 37-76.

<sup>4</sup> Ideas about long-term and working memory are more than academic theories: they are recognisable enough to be the basis of the highly successful Pixar films *Inside Out*. the second of which (2024) became what the BBC reported as 'the highest-grossing animated film of all time' (25 July 2024: <https://www.bbc.co.uk/news/articles/cz7e2jix594o>). See also, for example, <https://www.forbes.com/sites/jvchamary/2015/08/30/inside-out-science/>.

new facts that we've just received. So you can have five new things in your working memory and also process these by using some other ideas from long-term memory.

An illustration of this is expanding an algebraic formula. That requires multiplying or dividing coefficients – for example, solving the equation  $6x=48$  for  $x$ . It is far easier to do this if you instinctively know that 6 times 8 is 48. What that instinct means is having that fact in long-term memory. The whole 6-times table is a schema.

Learning is thus sending things to long-term memory. Schemas are important for this as well as for retrieval later. It is easier to remember new facts if we can assimilate them to existing schemas. If a student already understands what an objective report is, and thus has the relevant schema in long-term memory, then recognising a new piece of writing as an example of this is much easier.

The role of the expert teacher here is crucial.<sup>5</sup> Anyone who can read could in theory present a list of facts to a class. But without an expert understanding of how the facts hang together, and how students may learn them, very little learning will take place.

A good example is learning about the history of Scotland's involvement in the trans-Atlantic slave trade. The facts are indisputably necessary to provide the foundation of understanding – the number of people who were enslaved, the mortality rate in their being transported from Africa to the Caribbean, the extent of the financial involvement of Scottish merchants in paying for this, and the profits for the Scottish economy of the sugar plantations where the enslaved Africans were forced to work. But even in listing these facts, a complex set of explanatory schemas has to be used – the meaning of chattel slavery, why so many slaves died, and the place of sugar plantations in the global economy. To develop a full understanding, there also has to be the chronology of how the slave trade started and came to an end. That in turn depends on an understanding of political history.

Only a teacher with expert knowledge can make the account of the slave trade more than a list of facts. That expert teacher understands that what really matters is the big ideas – the schemas. Nevertheless, the detailed facts can provide ways into the topic. For example, focusing on the experience of children born into slavery in Jamaica can bring home to students today what that kind of bondage meant. Making links to place-names in Scotland – such as Jamaica Street in Glasgow – can help to show to students what the slave trade meant to Scotland's history. But for embedding these stories in long-term memory, the facts matter less than the broad understanding.

These features of learning are as true of practical skills as of theoretical ideas. The knowledge which we store in schemas may be of two kinds. One is *knowledge that* something is the case, for example, knowledge of facts and concepts. This is 'declarative knowledge', which can be articulated in words and writing. The other kind of knowledge is that of *how to do* something. This is 'procedural knowledge', which can't always be articulated, but can be demonstrated. Skills are the application of either

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<sup>5</sup> Stockard, J., Wood, T.W., Coughlin, C. and Rasplika Khoury, C. (2018), 'The effectiveness of direct instruction curricula: a meta-analysis of a half century of research', *Review of Educational Research*, 88(4), 479-507.

declarative or procedural knowledge. For example, schemas in physical education include an understanding of how the body works: thus how to perform a good jump shot in basketball requires knowledge of one's body and of the rules of the game, and an understanding of how to use that knowledge in a specific circumstance. Craft schemas include the practical capacity to use tools effectively – understanding what a tool does, and then applying that knowledge. Schemas in music include a knowledge of musical notation, genres, and historical development, and then the complex application of these in a performance. In fact, in all subjects a large part of learning is practical. There is less difference than is often supposed between the subjects usually called practical and those usually called academic. Adjusting the equipment in a physics experiment draws on the same practical schemas as repairing a car. A chemistry experiment uses schemas for measuring and sub-dividing physical quantities that come in useful in food technology.

In short, the research on how people learn shows the importance of structured knowledge and the ways in which that knowledge is retained, retrieved, and applied as skills. The case of the reform of the curriculum in Berwickshire High School illustrates how these principles can be developed in practice.

## How a knowledge-based curriculum could transform Scottish education<sup>6</sup>

When I started as headteacher of Berwickshire High School in August 2020, one of the first tasks was to review the quality of the curriculum. Interestingly (and perhaps surprisingly), the term ‘curriculum’ often means different things to different people who work in education. To some, it means little more than the *range of subjects* and the *timetable*. To others, it is *the totality of all that is planned for children and young people from early learning and childcare, through school and beyond*.<sup>7</sup>

One of the biggest issues I think we experience in Scottish education today is the prevalence of ‘over-complication’ at the expense of *practicality*. Conceptual ideas that might seem clever in theory aren’t necessarily useful at the level of schools and classrooms. As a senior school leader, the definition of curriculum that I find most useful and practical is one that frames the curriculum as ‘the *what*’ of education: the *specific knowledge and skills* we want young people to learn, and the *specific experiences* we want them to have.<sup>8</sup> In other words, when we think, ‘curriculum’, we should think ‘**content**’.

There are some who argue that to think of curriculum as *content* is somehow ‘reductionist’. However, I really don’t think it is and I’m actually not sure what is meant by that. If, by ‘content’, we mean **knowledge, skills** and **experiences**, far from being reductionist, this is fairly encompassing. The approaches we use to teach content – *pedagogy* – and resources that support these should be thought about separately to curriculum.

### Curriculum phases and structure

Like most secondary schools in Scotland, Berwickshire High School’s curriculum is divided into two phases: the Broad General Education (S1–3), which aims to build on the grounding that was provided in primary school, and the Senior Phase (S4–6).<sup>9</sup> In reviewing each phase, teachers and leaders in the school thought about three hierarchical levels of curriculum structure:<sup>10</sup>

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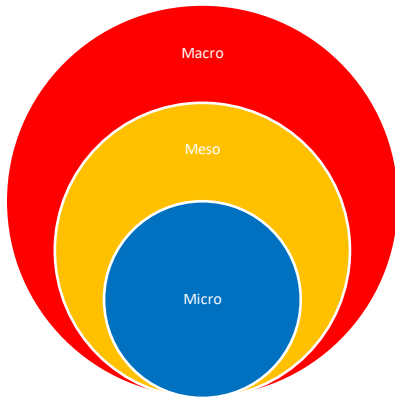
<sup>6</sup> This section was written by Bruce.

<sup>7</sup> <https://education.gov.scot/curriculum-for-excellence/about-curriculum-for-excellence/what-is-curriculum-for-excellence/>

<sup>8</sup> Robertson, B. (2021), *The Teaching Delusion 2: Teaching Strikes Back*, Woodbridge: John Catt Educational Ltd.

<sup>9</sup> This is often talked about as a 3+3 structure. However, everything that is discussed in this paper is as relevant to the 2+2+2 structure that some schools might be using.

<sup>10</sup> As discussed in: Robertson, B. (2021), *The Teaching Delusion 2: Teaching Strikes Back*, Woodbridge: John Catt Educational Ltd.



The macro-curriculum: subjects, the time given to these, and their purpose.

The meso-curriculum: topics and sub-topics within subjects.

The micro-curriculum: specific content – knowledge, skills and experiences.

### Senior Phase

In the Senior Phase (S4-6), the meso- and micro- curriculum are largely specified by the Scottish Qualifications Authority. Therefore, the curriculum review in Berwickshire High School focused on the macro-curriculum. Like many schools across Scotland, we reviewed this to ensure we were offering a broad range of courses that catered for the diverse range of needs and interests across our school community, working with external partners to support this. For example, we introduced Highers in Politics, Classics and Drama, along with a range of National Progression Award courses at SCQF<sup>11</sup> levels 5 and 6, including Applied Sciences, Criminology, Business and IT, Musical Theatre, Achieving Excellence in Sport, and Bee Keeping<sup>12</sup>. We also introduced a non-certificated course in Citizenship for all students, which focuses on developing knowledge of national and international political themes, such as climate change. Beyond this, we revised our approach to course choices to give students moving from S3 into S4 the option to choose between five and eight certificated subjects.<sup>13</sup>

### Broad General Education

In the Broad General Education (S1–3), the curriculum review spanned all three curriculum levels: macro-, meso- and micro-. An important finding was that, as in many primary and secondary schools across Scotland, the micro-curriculum consisted of little more than the national ‘Experiences and Outcomes’. For example:<sup>14</sup>

- I can discuss why people and events from a particular time in the past were important, placing them within a historical sequence.
- By investigating some body systems and potential problems which they may develop, I can make informed decisions to help me to maintain my health and wellbeing.

<sup>11</sup> Scottish Credit and Qualifications Framework

<sup>12</sup> Berwickshire High School was the first school in Scotland to introduce the Level 5 Bee Keeping course. Level 5 corresponds to National 5.

<sup>13</sup> Students who attend independent schools in Scotland often have the opportunity to study eight certificated courses in S4, and we wanted to ensure our students had the same opportunity, should they wish to do that.

<sup>14</sup> For anyone unfamiliar with the Broad General Education (3–15) phase of the curriculum in Scotland, the ‘Experiences and Outcomes’ are the detail teachers (and leaders) are given about what should be taught at school. You might be surprised by the *lack of detail* these actually offer.

- To show my understanding, I can respond to literal, inferential and evaluative questions and other close reading tasks and can create different kinds of questions of my own.
- I can extend and enhance my knowledge of digital technologies to collect, analyse ideas, relevant information and organise these in an appropriate way.

As can be seen from these examples, the national Experiences and Outcomes are generally vague and ambiguous, offering very little detail with regard to the *content* teachers and schools should be teaching.

### The importance of clear content

In the absence of clarity about what, *specifically*, should be taught in the Broad General Education – knowledge, skills and experiences – learning was often disjointed and fragmented. Sometimes, there was unnecessary repetition of content; other times, things that people might assume would be taught in a school weren't being taught at all. Because teachers felt they were being left in the dark with regards to what they should be teaching, lesson time was often being filled with tasks that were good for keeping students *busy* (and which they might find fun), but which weren't particularly good for *learning*. The scenario being described here for Berwickshire High School four years ago is one that is all too common in primary and secondary schools across Scotland today. The root cause of the issue is a lack of *content clarity*.

With this in mind, it should be little surprise that a recurrent criticism of teaching and learning in national inspection reports is that lessons lack pace and challenge. The quality of a school's curriculum is the foundation of strong pedagogy. Teachers' ability to make good decisions about the best way to teach particular things is dependent on them first being clear about what it is they are trying to teach. The national Experiences and Outcomes don't help them with that. They don't constitute a national curriculum.

### Addressing the issues

Accepting the importance of a clear, 'content-rich curriculum' – **knowledge-based and skills-orientated** – in September 2020, Berwickshire High School embarked on the lengthy process of developing and implementing this.

### Curriculum rationale

We began by thinking about the big picture and worked our way in. This meant agreeing an overarching curriculum 'rationale' to help guide the decisions we would be making about what to include in our curriculum. The rationale read as follows:

We want our students to:

- Learn the **knowledge** they need to understand the world around them.
- Develop the **skills** they need to continue to learn and contribute to society.
- Develop **attributes** that reflect our school values.
- Achieve a **portfolio of qualifications** that open the doors they need them to open and that reflect their very best.
- **Love learning** for the sake of learning, viewing it as interesting, exciting and empowering.

## Curriculum levels

We then considered our curriculum according to the three levels, discussed above: macro-, meso- and micro-.

### *Macro-curriculum*

In the Broad General Education, we reviewed the time that was being given to each subject and the teachers who were teaching these. For example, in humanities, we moved away from the scenario (common in many schools) whereby *any* humanities teacher could be teaching *any* humanities subject, to one in which, a history teacher teaches history and a geography teacher teaches geography. We also increased the amount of time given to humanities in S1–3. We did this because we were clear in our overarching curriculum rationale that learning at school isn't exclusively about preparing young people for work or getting qualifications. Whilst both are important considerations, I would argue strongly that the development of 'cultural literacy' is just as important, if not more important. We want young people to learn about things because they are interesting and worth knowing, not just because they will help them to get a job. When students read a newspaper, watch a documentary, visit a museum or hear a piece of music, we want them to be able to understand and appreciate the things they are seeing and hearing. As important, we want them to be able to think critically. The best way to help students to do all of these things is to teach them a *broad, deep body of knowledge* that they can use to *think with*.<sup>15</sup>

### *Meso and micro-curriculum*

The meso and micro curriculum for the Broad General Education were developed by 'unpacking' the national Experiences and Outcomes. To help reach decisions about the topics, sub-topics and specific content, we were guided by the '**5Cs of a content-rich curriculum**':<sup>16</sup>

#### *(A) Clarity*

The content we want students to learn should be crystal clear. It needs to be set out in meticulous detail. For example, in maths, if a curricular statement reads, 'Add and subtract mixed numbers', then examples should be given to make clear *exactly* what that means. In English language, we would specify words that students should be taught to spell and use, and specific texts that we want them to experience.

#### *(B) Connection*

New content should link to and build on previous content, lesson by lesson, week by week, month by month, term by term, and year by year. We should see this *within* subjects and *between* subjects. Timelines should be used to help establish connections and bring about a sense of chronology.

#### *(C) Challenge*

We should have high aspirations for *all* of our students. We need to challenge them with challenging content from an early age and keep on challenging them. If one school does this and another doesn't, all we do is create inequality in our education system.

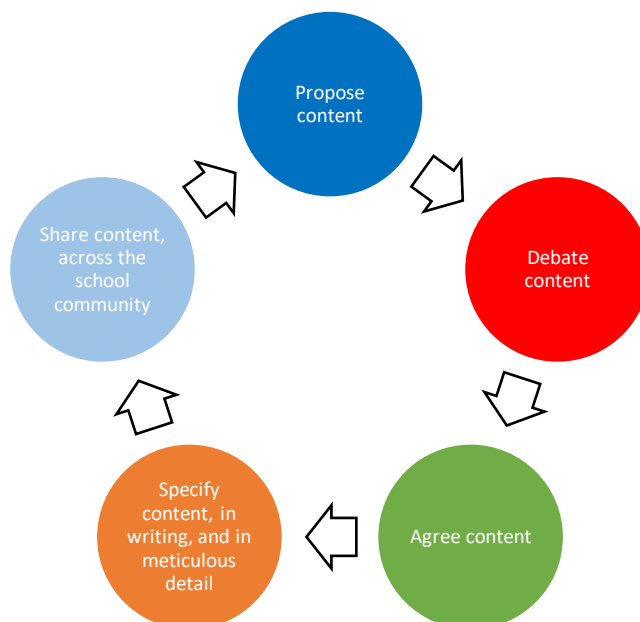
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<sup>15</sup> William, D. (2018), *Creating the Schools Our Children Need: Why What We're Doing Now Won't Help Much (And What We Can Do Instead)*, West Palms Beach, FL: Learning Sciences International.

<sup>16</sup> Robertson, B. (2021), *The Teaching Delusion 2: Teaching Strikes Back*, Woodbridge: John Catt Educational Ltd.

#### (D) Collaboration

The specific content that we are teaching should be discussed, debated and agreed upon by a range of stakeholders. Teachers, subject leaders and school leaders should all be part of this. There is a role for students and parents too. Nothing should be off the table, but nothing should be guaranteed. Sometimes, this will require compromise. Individual preferences and biases should be acknowledged and discussed.



#### (E) Change

Over time, the content of a school's curriculum should evolve. Where we see gaps, we should address these. For example, in science, the content of a school's curriculum should evolve to include recent developments in genetics; in computing, the same should happen in relation to AI. For this to happen, there needs to be a planned programme of meetings to discuss curriculum content. This includes at senior and middle leadership levels, and in teams responsible for teaching particular areas of the curriculum.

### Programme of Teaching and Learning

The curriculum for the Broad General Education in Berwickshire High School today is set out in documents called **Programmes of Teaching and Learning**, which take the following format:<sup>17</sup>

<sup>17</sup> As discussed in: Robertson, B. (2021), *The Teaching Delusion 2: Teaching Strikes Back*, Woodbridge: John Catt Educational Ltd.

Term	Core Content		Useful resources
	Knowledge & Skills	Experiences	
1	<b>Astronomy</b> <ul style="list-style-type: none"> <li>• The universe: an extent almost beyond imagining</li> <li>• Galaxies: Milky Way and Andromeda</li> <li>• Our solar system <ul style="list-style-type: none"> <li>• Sun: source of energy (heat and light)</li> <li>• The nine planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto [Note that in 2006 Pluto was classified as a dwarf planet]</li> </ul> </li> <li>• Planetary motion: orbit and rotation <ul style="list-style-type: none"> <li>• How day and night on Earth are caused by the Earth's rotation</li> <li>• Sunrise in the east and sunset in the west</li> <li>• How the seasons are caused by Earth's orbit around the sun, tilt of the Earth's axis.</li> </ul> </li> </ul>	Watch <i>this</i> video Carry out <i>this</i> experiment	<i>This</i> PowerPoint presentation <i>This</i> website

Examples of specific content from a range of different subject areas are as follows:<sup>18</sup>

English	<b>Spelling</b> <ul style="list-style-type: none"> <li>• Apply known morphology skills (roots, prefixes, suffixes, and spelling changes) to correctly spell words.</li> </ul> <b>Grammar</b> <ul style="list-style-type: none"> <li>• Use pronouns correctly, including - the proper case (objective, subjective, or possessive) - intensive pronouns (e.g., myself, ourselves)</li> <li>• Recognise verbs in active voice and passive voice, and avoid unnecessary use of passive voice.</li> <li>• Recognise troublesome verbs and how to use them correctly (e.g., sit/set; rise/raise).</li> <li>• Correctly use frequently confused words (e.g., good/well; accept/except; principle/principal; affect/effect; who/whom; their/there/they're; to/too/two).</li> </ul> <b>Vocabulary</b> <ul style="list-style-type: none"> <li>• Apply a variety of strategies to figure out the meaning of S1 words and phrases, such as the following: - context clues - examples - definitions - cause-and-effect relationships - comparisons - synonyms and antonyms</li> <li>• Distinguish connotations, or shades of meaning, among words with similar denotations (e.g., cranky, grumpy, grouchy, and mean).</li> </ul>
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<sup>18</sup> <https://www.berwickshirehighschool.co.uk/curriculum>

	<ul style="list-style-type: none"> <li>• Use knowledge of Greek and Latin roots and affixes to figure out the meaning of a new word, such as <ul style="list-style-type: none"> <li>○ annus [L] year: annual, anniversary</li> <li>○ ante [L] before: antebellum, antecedent</li> <li>○ aqua [L] water: aquarium</li> </ul> </li> </ul> <p><b>Sayings and Phrases &amp; their meanings / origins</b></p> <ul style="list-style-type: none"> <li>• All for one and one for all</li> <li>• All's well that ends well</li> <li>• Bee in your bonnet</li> </ul>
Geography	<p><b>Volcanic Eruptions</b></p> <ul style="list-style-type: none"> <li>• Key features of volcano: crater, cone, secondary cone, ash cloud, lava bombs, lava, magma</li> <li>• Mount St Helen's Washington 1980 and Eyjafjallajökull</li> <li>• Impact of the eruption – social, economic and environmental</li> <li>• Prevention and mitigation strategies to reduce the impact of further eruptions; emergency alerts, town planning, personal planning, seismometers, tiltmeters, thermal imaging, camera imagery, measuring gas escapes and temperatures</li> </ul>
Maths	<p><b>Operations on whole numbers</b></p> <ul style="list-style-type: none"> <li>• Solve multiplication and division problems working with whole numbers, using efficient written and mental methods, e.g. <math>94 \times 7 = 100 \times 7 - 6 \times 7</math>.</li> <li>• Multiply whole numbers by 2 digit numbers, e.g. <math>47 \times 12 = 47 \times 4 \times 3</math>.</li> <li>• Divide whole numbers by a single digit, e.g. <math>42 \div 6</math>.</li> </ul>
Music	<p><b>Practical skills</b> Play chords of C, F, Am and G7 (Ukulele), using a continuous strumming style, in time with a melody/accompaniment:</p> <ul style="list-style-type: none"> <li>• Budapest (George Ezra) – F, C</li> <li>• Down by the Riverside – F, C</li> <li>• Next to Me (Emeli Sande) – Am, C (Extension: G7)</li> </ul> <p><b>Musical literacy</b></p> <ul style="list-style-type: none"> <li>• Notes in the treble clef from A3 to C5</li> <li>• Patterns of different note lengths, including Semibreves, minims, dotted minims, crotchets and quavers</li> <li>• Quaver, Crotchet, Minim and Semibreve rests</li> </ul>
Physical Education	<p><b>Hockey: Evasion</b></p>

	<ul style="list-style-type: none"> <li>• Identifying space through scanning</li> <li>• Creating/exploiting space through good footwork</li> <li>• Running into the space with/without ball</li> <li>• Support ball carrier</li> <li>• Acceleration/deceleration away from the defender</li> </ul> <p><b>Hockey: Control</b></p> <ul style="list-style-type: none"> <li>• Receiving the ball – low body position, weight on balls of feet, stick low and central</li> <li>• Dribbling – low body position, ball away from feet, ball ‘glued’ to stick, scanning for passing options/space (front/reverse stick)</li> <li>• Control without ball – be in ready position to intercept/tackle</li> </ul>
Science	<p><b>Inheritance and DNA</b></p> <ul style="list-style-type: none"> <li>• The nucleus is an organelle containing chromosomes.</li> <li>• Chromosomes are long strands of DNA.</li> <li>• Genes are sections of the DNA.</li> <li>• Genes determine what characteristics we have</li> </ul> <p><b>The Eye</b></p> <ul style="list-style-type: none"> <li>• Cornea: The clear outer layer at the front of the eye</li> <li>• Iris: Changes the size of the pupil</li> <li>• Pupil: The part of the eye that allows light to enter</li> <li>• Lens: A jelly material that Focuses light onto the retina.</li> <li>• Retina: Detects light at the back of the eye.</li> <li>• Optic nerve: Transfers information from the retina to the brain.</li> </ul>

Programmes of Teaching and Learning help teachers, school leaders, parents and students to be clear about what, *specifically*, is being taught in the ‘**core curriculum**’. Nothing gets left to chance. Teachers and students still have the opportunity to go *beyond this core* and to make some of their own decisions about content (so learning isn’t being limited), but the core curriculum is clear and common to everyone.

*Making decisions about what content to include*

Debate is the key to determining the content of your school curriculum. If there were simple answers to what should be included, everyone would have them, and every school would be teaching these things. But there aren’t.

*Start big and work in*

In debating curriculum content, it is usually best to start with the big picture and work in. For example, teachers and school leaders might ask:

- After x number of years learning in our subject or school, what should all students know and be able to do?

- After x number of years learning in our subject or school, what can't you leave without having learned about?

### *Content Cues*

Questions of this type can be useful but are of course very broad. To steer the debate, more specific **Content Cues** can be helpful. These are useful because they help to identify content. The Content Cues we considered in Berwickshire High School were as follows:<sup>19</sup>

1. The **building blocks** that students will need if they decide to specialise in this subject in future.
2. The **big concepts and ideas**, the character of which varies among subjects.
3. The **major works of major people**, which, too, can mean different things in different subjects (such as writers, performers, inventors, and so on).
4. The knowledge students are likely to need to **understand, appreciate and look after the world around them, and beyond**.
5. The knowledge students are likely to need to **understand, appreciate and look after themselves, and others**.
6. **Key dates and timelines**.
7. **Key vocabulary**, including the etymology of words.
8. Knowledge and experiences that **subject teachers believe are interesting**.

### *Subject-specific considerations*

Some subjects lend themselves better to debate than others. For example, in maths and science, where content and concepts *build on* one another – **vertical links** – certain things *have to be taught* before another. The debate isn't so much *if* something should be taught, but *when* it should be taught. In other subjects, such as history, art and English literature, where content and concepts *relate to* one another but don't require one another – **horizontal links** – there is more scope for debate about *what* the specific content is.

If we take geography as an example, part of the debate might go as follows:

- Do we want students to know the names of every continent?
- *If yes*: do we want students to know where the continents are in relation to each other?
- *If yes*: do we want students to know the names of every country in every continent?
- *If no*: do we want students to know the names of *some* countries in some continents?
- *If yes*: Which ones, and why are we choosing them? (*Lots of discussion*)

In an English curriculum, the debate might take the following form:

- Should all students learn about a Shakespeare play?
- If so, does everyone need to learn about the same play?
- If so, which one?
- Is *Richard III* a better play to study than *Macbeth*? Why?

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<sup>19</sup> As discussed in Robertson, B. (2021), *The Teaching Delusion 2: Teaching Strikes Back*, Woodbridge: John Catt Educational Ltd.

These are precisely the sorts of curriculum content conversations we now ringfence time for in Berwickshire High School every year.

### The impact

By making significant improvements to the clarity of the curriculum, Berwickshire High School is now seeing significant improvements in pedagogy, assessment and attainment. These were highlighted by inspectors in their visit to the school in November 2021:<sup>20</sup>

The quality and consistency of learning, teaching and assessment has improved considerably across the school, with teachers demonstrating increased confidence in classrooms... . Staff across the school have engaged effectively in reviewing the curriculum. A 'knowledge curriculum' has been agreed to help staff, learners, parents and partners know what young people are expected to learn in each subject area by the end of the BGE... . Improvements in the curriculum are providing a wider range of experiences and pathways for young people, and helping to motivate young people's learning.

The improvements to the quality of the curriculum (pedagogy and assessment) are now starting to impact positively on attainment in the Senior Phase. For example, in 2023 the percentage of students attaining 5+ Level 5 qualifications in S4 was 64% (in 2018 the figure was 44% and in 2019 it was 45%). In 2024, the percentage of students attaining 5+ Level 6 qualifications in S5 was 41% (in 2018 the figure was 21% and in 2019 it was 29%).<sup>21</sup>

### A suggested way forward, nationally

The approach Berwickshire High School has taken to developing a knowledge-based, skills-orientated curriculum in the Broad General Education has been very successful. Based on this, arguments could be made for every school across Scotland to embark on a similar approach, adapting the approach to their own conditions. However, I think this would be a mistake. The main reason is because in almost all subject areas, all we are going to get is unnecessary duplication of work and an enormous waste of teachers' time. It is reasonable to expect teachers to spend time each week planning high-quality teaching approaches – that is, that they focus on *pedagogy*. However, it is unreasonable to expect them to do this and to focus on *curriculum*.

In the early years of the implementation of Curriculum for Excellence, the 'unpacking' of Experiences and Outcomes was almost certainly the approach policy makers wanted schools to take. However, this expectation wasn't made sufficiently clear and schools were not given sufficient time to do this. Nor was there any robust exemplification of how to do this well. The logic for getting schools to take this approach to curriculum development was to 'empower' teachers and schools by giving them autonomy over curriculum content decisions and to let them tailor these to their own local context. I have no doubt that good intentions sat behind such logic. However, if we are being honest, we must acknowledge that this approach has not been successful.

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<sup>20</sup> <https://www.berwickshirehighschool.co.uk/page/?title=Inspection&pid=111>

<sup>21</sup> Level 5 corresponds to a pass in National 5, Level 6 to a pass at Higher.

Across Scotland, the quality of curriculum in the Broad General Education varies wildly from school-to-school, meaning the quality of pedagogy and assessment do the same. To be clear: the fault does not lie at the door of teachers or schools. This is an issue that sits squarely with those who make national curriculum policy decisions.

However, it is not all doom and gloom. The curriculum can be significantly improved by strong school leadership and a coherent approach by the whole school staff. At a national level, it's actually very easy to do something relatively quickly and transformational about the quality of curriculum we have: **develop national Programmes of Teaching and Learning for the Broad General Education, detailing the specific content – knowledge, skills and experiences – we want students to be taught, regardless of the school they attend.**

At this level, content can and should be specified, whilst still allowing room for teachers and students to make some content decisions themselves. Bodies such as Education Scotland could then focus on supporting schools by developing high-quality teaching resources, which teachers would then have the opportunity to use to enhance their practice. Such bodies could also produce assessment instruments that are more standardised, so that meaningful judgements and comparisons can be made about the learning and progress of students in the Broad General Education across Scotland.

Over time, as discussed above, the specific content of the national Broad General Education can – and should – change. However, as a starting point, an imperfect content-rich curriculum is infinitely better than a no-content curriculum, which is effectively what Scotland has today.

The future of the curriculum in Scotland can be very positive one: we just need to start nailing our colours to the mast with regards to what we actually want young people to learn, *specifically*. Content clarity is a crucial prerequisite to high-quality teaching and learning in schools and across the education system as a whole.

## Conclusions

The experience of Berwickshire High School shows how the general ideas underpinning a knowledge-based curriculum can be put into practice. In fact, a better description of it is 'knowledge-based and content-rich'. Ideas about knowledge form the structure. The content fills out that structure. The school's redesign of its curriculum started by asking what knowledge it wanted its students to learn, what skills and personal attributes it expected them to acquire, and what evidence of attainment they might collate – in the form of qualifications – that might open up opportunities for them when they left school. In constructing a curriculum that would contribute to these aims, the school drew on five key principles that arise from the general understanding of how people learn and how teachers can enable them to do so:

### *Schemas*

The curriculum has to be based on schemas, the big ideas of each subject. These are the structures of the subject – the connections between the detailed content that makes up a subject, and the paths through that content which enable students to build up an understanding progressively. That, in essence, is what is meant by a knowledge-based and content-rich curriculum – a curriculum that is designed around the schematic structure of each subject. Most of this structure has to be set out in a national curriculum as the ideas which define each subject. The whole specification of the macro and meso curriculum belongs at that level, and yet at present is missing from Scotland's Curriculum for Excellence. The national curriculum should also provide a range of examples of the micro-curriculum. These are canonical ideas: specific depth on particular planets in the solar system; specific composers in music; and so on. These examples should be provided nationally as a menu of illustrations of the big ideas. Schools should be able to choose which to use.

### *Meticulous detail*

The details of the curriculum have to be set out systematically, so that the teacher can take the students through the content step by step. Some of this detail can be decided by the school, and need not be specified nationally. That is because this is often the way to tailor the big ideas of each subject to the specific context and interests of the students. Policy makers at national and at local-government level have to make sure that school staff have the autonomy and resources to do that. Some of the detail might be settled after discussions between the school and parents or the wider community. Some of it might, after all, be set out nationally as exemplars, if that would be helpful to schools and teachers. But the main point from Berwickshire's experience is that the detail must be specified. Teaching is not reinventing these details; teaching is applying the details imaginatively in each lesson, with sensitivity to each student.

### *Memory*

The purpose of teaching is to enable students to transfer ideas from working memory into long-term memory, and to get students to practise retrieving these back out again. Ideas mean not just abstract thoughts but also capabilities and skills – being able to play an instrument, or conduct an experiment, or repair a car engine, or perform well in a sport. A well-designed curriculum facilitates the teacher's work in developing all kinds of memory. The Berwickshire experience confirms that the

micro details of the curriculum design become the details of the lesson plan. The connection between ideas in the subject enable the teacher to convey to students how the step-by-step details hang together. The increasing difficulty of the ideas poses challenges that the teacher can use to motivate the students to do well. All these progressive steps are defined by the schemas appropriate to the lesson.

#### *Interdisciplinary learning rests on subjects*

Scottish policy strongly encourages interdisciplinary learning, on the grounds that real-world problems don't come in neat bundles that might fit inside school subjects. This is perfectly valid, and is an admirable aim. But meaningful interdisciplinary learning will only come about if we have clarity about what we plan to teach in different subjects at particular times. Otherwise, what typically happens is that this is reduced to things that are either tokenistic or one-offs (such as a thematic day across the school), which do little to enhance learning. Interdisciplinary learning must be planned only on the basis of sound disciplinary learning.

An example might clarify this. A good source of interdisciplinary topics is the environment, enabling students to see that the natural world sets the context for human activities and also is deeply affected by these. Understanding this complexity requires attention to all aspects of natural science, to many features of social change, to our ethical responsibilities, and to the psychology of human action (for example, the difficulty of changing our habits). The point here is that some clear knowledge of each of these specialist domains is needed before any understanding of the environment can be developed. An interdisciplinary project on, say, pollution in a local river, will almost certainly benefit from students *first* having been taught relevant disciplinary knowledge from across a range of subjects. That's what we mean by saying that interdisciplinary learning needs subjects. The interdisciplinary river-pollution project helps students to simultaneously draw on knowledge from across a range of subject disciplines, developing connections between schemas. In doing so, it both strengthens understanding and enriches the learning experience. Thus the study of the river has to be integrated into the specialist study of each of these subjects, not added as a decoration on top of them. We certainly are not saying that interdisciplinary work is less important than subjects. But subject knowledge of the kind that has been outlined in this paper is a necessary precursor to any meaningful interdisciplinarity.

#### *Expert teachers*

The key to all this working in practice is having expert teachers. They need to know thoroughly the detail of the knowledge and skills that the curriculum specifies, and also to know how to work closely with colleagues in different subject areas. They need to know how students learn the subject matter, and they need to know also the typical misconceptions which students have. This body of professional expertise has been called pedagogical content knowledge: that is both knowledge of the content of the subject and also knowledge of how to teach the subject. Teacher professionalism is not reinventing the content; it is adapting it to the students in front of them and taking account of their whole lives inside and outside school.

The example of Berwickshire High School has shown that these five principles can be put into practice. How that might be done elsewhere will be different in detail. But the big ideas have to be the same across the country, because they are intrinsic to what we mean by subjects of study: the big ideas are the schemas that define each subject. Setting out these schemas is the role of national agencies, such as the Scottish national authorities for the curriculum and for assessment. The school's role is to interpret these national definitions of content into details of lesson plans and into the daily work of the classroom. However, as discussed in the third section of this paper, it should also be helpful to both primary and secondary schools if *some* detail is specified at national level, even if this is only for the purposes of exemplification or to offer options for schools to choose from. The current situation in Scottish policy fails to achieve the clarity required to ensure a high-quality curriculum in all schools. The Experiences and Outcomes specify neither details nor the big ideas, and so the schools are forced to discover these for themselves.

Although the discussion here has mostly been about secondary education, there are implications also for the primary stages. Primary school is where the broad schemas are first laid down – for example, an understanding of how numbers work in arithmetic, a sense of the grammatical structure of language, the building blocks of a scientific view of nature, and a capacity to grasp historical change or the variation in human experience across different cultures. One of the challenges of integrating these concepts into primary education is to avoid making that stage merely a preparation for secondary, even though it is certainly that, too. For example, the ways in which introductory science might appear in primary school has to relate to children's spontaneous curiosity about the natural world, an inquisitiveness that itself changes greatly as the child grows from age 5 to age 12. What matters in primary, therefore, is both arousing pupils' enthusiasm by engaging them with the structures of learning and also laying the groundwork for the secondary-school courses that have been the main topic of this paper. These aims can be more readily met if there is agreement on what needs to be learned by the end of primary. That would usually mean agreement between a secondary and the primaries that partner with it. Concerted action of this kind can smooth the transition of pupils to secondary, and can allow the sharing of ideas for teaching among these schools. It should also help to ensure that there isn't unnecessary repetition of content at secondary school, a scenario that can easily arise if there is a lack of clarity about what is being taught in primary schools. It is just as important that secondary school teachers are as clear about the content of a primary schools' curriculum as those who teach in the primary sector. Primary school teachers need to know what is being taught in the early stages of secondary school to help guide any content decisions they have control over. If primary teachers aren't clear about what's being taught in secondary school and vice versa, it's perfectly possible that knowledge and skills one might assume are being taught at *some stage* of schooling never get taught at all. A greater degree of content specification at a national level should help steer and support curriculum conversations between the primary and secondary sectors.

Berwickshire's experience, based on the principles outlined in this paper, shows that a knowledge-based and skills-oriented curriculum can be achieved without the disruption that would be caused by the complete overthrow of Curriculum for

Excellence. It shows that such a curriculum can attract approval from the school inspectors, and can contribute to raising formal attainment by students. And it shows that a nationally specified curriculum of this kind can strengthen teacher professionalism in the only way that matters – helping each individual student to learn important knowledge and useful skills.

