Guy Claxton and Graham Powell

POWERING UP STUDENTS

The Learning Power Approach to High School Teaching

Foreword by John Hattie

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Foreword by John Hattie

There is a common "grammar of schooling" present in many classrooms.[1] Teachers talk a lot. Tell-and-practice routines are common (teacher tells, students practise). Teachers ask many questions (more than 200 a day, by one estimate), to which the students know that the teacher already knows the answers, and which they are rarely given more than one to three seconds to consider. Students sit in rows or in groups (but mostly working alone), in classrooms where almost all of what goes on is decided and directed by the teacher, so students become increasingly compliant, dependent, and diligent (unless they decide to rebel). Many succumb to a passive ethos of teacher questions, class work, and assignments: "Just tell me what I need to know so I can tell it back to you." When such students are asked, "Who is the best learner in the class?" they tend to point to a student who cottons on quickly to what is required, does not have to put in much effort, and regularly delivers back "right answers" to the teacher. When we ask students if they find this model acceptable, successful students – those who are doing well out of the conventional "grammar" – often seem eager for *more* teacher-talk, *more* superficial coverage, and yet more content. They aren't keen on being asked to grapple with open-ended questions, complex or so-called "wicked" problems, or group assignments. They have been led to expect that high-stakes tests can be successfully completed merely by knowing lots.

There is currently considerable pushback against this "grammar" from a number of quarters, and education has become something of a battleground. Some are calling for a more "consumerist" model, in which education is seen as an economic transaction; the learner is a consumer who has needs, the teacher is a provider aiming to meet these needs, and education is a commodity to be delivered and consumed. Learners are invited to learn with attractive, exciting, and engaging activities, and debates about the content and purpose of education come to centre around "what the market wants". But this economic perspective has itself been subject to critique. Students may know what they *want*, but is it what they *need?* What and how we teach, as Gert Biesta

1 David Tyack and William Tobin, The "grammar" of schooling: why has it been so hard to change? *American Educational Research Journal* (1994), 31(3): 453–479. Available at: https://doi.org/10.3102/00028312031003453.

has recently argued, should be seen as social and moral questions, and not merely as questions of individual consumer preference. He notes that education can, and more importantly should, lead to disturbing challenges because it involves asking students difficult questions and exposing them to otherness and difference.[2]

Another challenge to the traditional model comes from employer organisations and some governments, who are demanding that education should be producing entrants to the job market who come with more than packages of quality-assured knowledge; they should have initiative, articulacy, conviviality, and entrepreneurialism as well. Schools should be teaching attitudes and abilities that go by a variety of names: 21st century skills, non-cognitive skills, soft skills, learning strategies, and so on. And as large testing groups like PISA add collaborative problem-solving and creative thinking as a focus of their investigations, there is pressure on schools to add these skills as topics or domains within the curriculum. Some even go so far as to ask, "Why would we want to stuff kids' minds full of knowledge when we can offload such cognitive effort onto Alexa, Siri, and Google?" This emphasis, too, has its opponents, who argue that there is a necessary competition between the cultivations of such skills and the rigorous transmission of important and valuable bodies of knowledge. "How can you teach students creative thinking," they retort, "when you have neglected to teach them anything worthwhile to think *about*?"

Happily, through the hubbub of this multidimensional battleground, riddled with simplistic polarities and false oppositions, some more nuanced and productive voices are beginning to be heard. Our own work on Visible Learning (VL) argues against aspects of these antiquated grammars of schooling.[3] The messages of the VL research include inviting teachers to work together with students to evaluate their impact; asking for transparent and high expectations to underpin everything that happens in a school; moving towards explicit success criteria for mastering deeper aspects of the content; using the Goldilocks principle of challenge (not too hard, not too boring) to impel learners to move towards these success criteria; seeing errors as opportunities

2 Gert Biesta, What is education for? On good education, teacher judgement, and educational professionalism. *European Journal of Education, Research, Development and Policy* (2015), 50(1): 75–87. Available at: https://onlinelibrary.wiley.com/doi/full/10.1111/ejed.12109.

3 See John Hattie, *Visible Learning for Teachers: Maximizing Impact on Learning* (Abingdon and New York: Routledge, 2012), and John Hattie and Klaus Zierer, *10 Mindframes for Visible Learning: Teaching for Success* (Abingdon and New York: Routledge, 2018).

to learn (which means building high trust and supportive environments in which to fail and learn); teaching how to hear and maximise feedback (especially to teachers) about impact; and focusing on getting the right proportions of surface content, deep understanding, and transfer of learning.

And Guy Claxton, too, is a leading proponent of these more integrated and constructive views. A prolific writer and thinker, one of his earlier books, *Educating Ruby: What Our Children Really Need to Learn*, written with his colleague Bill Lucas, remains my favourite sketch of a different approach to education in the 21st century – one that reconciles many of these competing claims and perspectives.[4] But that book was only a sketch, written for a general audience, and especially parents, to help them to appreciate new possibilities. Now, written with long-time collaborator and former high school principal Graham Powell, comes *Powering Up Students: The Learning Power Approach to High School Teaching*. This is actually the third in a projected series of four books that weaves together the threads of a new philosophy of teaching and learning that has been emerging in different groups, across the world, over the last 15 years or so. The first book laid the foundations. The second drew out, in great detail, the practical implications for elementary or primary school teachers. Now this third book does the same for high schools. The book outlines a range of design principles underpinning a style of teaching that develops both rich and secure understandings, and a set of broader attitudes and dispositions towards learning as a whole, and is richly illustrated with practical strategies and real-life examples that Guy and Graham have seen pioneered in classrooms around the world.

Powering Up Students will help teachers to understand a new and exciting middle ground where knowledge is valued and respected, but is also put to work to develop transferable abilities to critique, evaluate, link, create, and apply knowledge where it is needed. They will see how the old grammar of school can be leveraged to impact on students' love of learning, their developing learning skills, and their advancing achievement. The authors outline many methods to develop secure and accurate understanding, to cultivate and coach skills, and to develop more general attitudes and habits of mind, but they offer more than a compendium of teaching strategies. They also delineate the facets of the underlying *culture* that needs to be cultivated

4 Guy Claxton and Bill Lucas, *Educating Ruby: What Our Children Really Need to Learn* (Carmarthen: Crown House Publishing, 2015).

by teachers if students are to become independent learners, ready and willing to design, pursue, and evaluate learning for themselves, alone and with others. It is this combination of the strategic and the cultural which leads to their Learning Power Approach. In my language, Guy and Graham are showing teachers how to develop "the skill, will, and thrill" of learning; and I would add that learning to know when the time or opportunity is right to develop surface or deeper learning is also crucial. Being a powerful learner involves balance, agility, and appropriateness. For example, when first learning a new topic, a higher proportion of surface knowledge may be worthwhile, but as one becomes more proficient, one can switch to the deeper skills of relating, extending, and exploring.

Now is an exciting time in education, and the development of new models of teaching is key. In *Powering Up Students*, Guy and Graham make a major contribution to our understanding of how teachers can prepare young people not just for a life of tests, but for the tests of life.

Contents

Introduction

This book on the Learning Power Approach (LPA) is for high school teachers.[1] But it is not for all of them. It is only for those who are really serious about teaching in a way that builds character while ensuring that all students get the exam results and qualifications that will help them in the future. It is for teachers who are hungry for ideas and information about how to do that, and ready to change their way of being in the classroom to achieve that end. Let us explain.

School is about more than examination results. Everyone knows that. Everyone agrees. No school proudly claims on its website, "Send your children to us and we will squeeze the best grades we can out of them, by hook or by crook. And that is all we care about." If pressed, every school protests that "we are not just an exam factory, you know". There is always some acknowledgement that forming powerful habits of mind in students matters too: that we want them all to grow in confidence, kindness, resilience, or "mental agility". "Fulfilling their potential" doesn't just mean "getting top marks". We want good results, but we want *results plus*: grades *plus* a character that is ready for the challenges and opportunities of the mid to late 21st century, as best we can predict what those will be. We can't imagine a school that wants *results minus*: students with good grades but who are timid, dependent, unimaginative, and unadventurous.

The key question is: what does that *plus* amount to? What exactly do we want our students to be *like* when they leave our class, or move onto college or the world of

1 In the UK, the term "secondary schools" is generally used, but, as we hope this book will be useful to teachers in many different countries, we are going to use the term "high schools" which is more common internationally. We do, however, frequently refer to features within the English system, such as: SATs, GCSEs and A levels (all high-stakes exams, taken at ages 11, 16 and 18 respectively); Ofsted (the body that inspects and judges schools); and Years and Key Stages (into which high school education is divided). Key Stage 3 comprises the first three years of high school education (Years 7–9, during which children are aged 11–14). Key Stage 4 comprises the final two years of compulsory schooling (Years 10–11, educating 14–16-year-olds). In the USA, school years are called "grades", and they tend to be one year "behind" the English years, so tenth grade corresponds roughly to Year 11. Post-compulsory education for 16–18-year-olds is usually delivered in sixth forms or colleges, and is sometimes referred to as Key Stage 5.

work? And how exactly is our school – and especially our teaching – going to look different if we take this plus as seriously as we can? How are we going to teach maths differently if we want our students to be growing an adventurous and creative spirit at the same time? How are our displays of students' work going to look different if we want them to develop a sense of craftsmanship – a genuine pride in having produced the best work of which they are capable? We all want our students to become more resilient – to be inclined and equipped to grapple intelligently with things they find hard. So how are our forms of assessment going to tell us whether we are successful: whether our Year 11s are indeed more resilient than they were in Year 7?

Lots of teachers and school leaders espouse these values. Some of them have thought through – in detail – exactly what it will take, and set in motion – with the requisite degree of precision – the necessary changes. But many are still hesitant, awaiting clearer guidance and support from departments of education or academic "thought leaders". Or they have got a firm hold on part of the challenge, but not yet figured out the whole of it. They work on resilience, but not imagination; on collaboration, but not concentration; on self-esteem, but not critical thinking; or, conversely, on higher order thinking skills, but not empathy.

The LPA shows in systematic detail how to go beyond the sound bites and the posters to create classrooms that really do grow robust, inquisitive, imaginative, and collaborative learners – lesson by lesson, week by week, year on year.

It is this detailed and comprehensive help that the LPA provides. It is for teachers and schools that really want to take the plus seriously, and have begun to realise the implications of doing so. They know that "team games" are not enough to grow collaboration; that becoming a good collaborator is as much to do with the way we teach English as it is to do with the sporting trophies in the foyer cabinet. They know that a few fine words on the home page of the school website, or in a policy document on teaching and learning, are not enough. They have quickly realised that some glossy posters downloaded from Pinterest about growth mindset and "the power of yet" are not enough. You have to "live it, not laminate it", as the Twittersphere pithily puts it!

For example, Sam Sherratt, who teaches the Primary Years Program of the International Baccalaureate (IB) in Ho Chi Minh City, wrote in his blog back in 2013, "All too often, in IB schools, the Learner Profile [a list of desirable attributes] exists in the form of displays and catchphrases, but doesn't exist as a way of life, as a code of conduct or as an expectation for all stakeholders. We are not going to let that happen at ISHCMC [his school]!"[2] The LPA shows in systematic detail how to go beyond the sound bites and the posters to create classrooms that really do grow robust, inquisitive, imaginative, and collaborative learners – lesson by lesson, week by week, year on year.

> We want good results, but we want *results plus*: grades *plus* a character that is ready for the challenges and opportunities of the mid to late 21st century.

So this book is crammed full of practical illustrations, advice, and hints and tips. It is designed for busy high school teachers who want to get started on the LPA journey, and for others who have already made good progress, but may feel a bit stuck for fresh ideas or are wondering about the next step to take. And there is always a next step. As our understanding of the LPA has deepened, the horizon of possibility keeps receding in front of us. The further you go in training students to take control of their own learning, the deeper the possibilities that are opened up.

Depending on where you are in your journey, some of our suggestions will be very familiar to you, and some might seem rather pie in the sky. The spot we try to hit, as much as possible, is the area in between "I do it already. Tell me something new", and "in your dreams, mate": the spot where you sense a new possibility for tweaking your existing style and it feels plausible and doable with the real live students you teach. That's what we want you to be on the lookout for. So if something seems familiar, we invite you to think about how you could stretch what you already do just a little more. And if a suggestion seems far-fetched it may nevertheless spark a train of thought that leads to a more fruitful idea.

The LPA is not a set of rigid "recipes for success"; it is a set of tools, ideas, and examples that we hope you will critique and customise to suit your own situation. All we ask is

2 Sam Sherratt, Parent workshops: the IB learner profile, *Making PYP Happen Here* [blog] (7 October 2013). Available at: https://makingpyphappenhere.wordpress.com/2013/10/07/36/.

that you hold fast to the spirit and the values while you are developing your own version. Sometimes we have seen people introduce – without meaning to – the "lethal mutation" that kills the spirit. For example, if you slip into seeing the LPA mainly as a way to rack up those conventional test scores, you have missed something really essential. Rather, we develop habits of mind like resilience and resourcefulness mainly because *they are valuable outcomes of education in their own right* – and then we keep an eye on making sure that the results go up too.

The LPA is very far from being a quick fix or the latest fad. It is actually quite demanding because it requires us to re-examine our natural style of teaching, and to make small but real experiments with our own habits in the classroom. As Sir Ken Robinson has said, "If you want to shift culture, it's two things: its habits and its habitats – the habits of mind, and the physical environment in which people operate."[3] The LPA requires some honest self-awareness and reflection, and that can be quite effortful and sometimes even uncomfortable. We told you the LPA wasn't for everyone!

> The further you go in training students to take control of their own learning, the deeper the possibilities that are opened up.

But our experience tells us that nothing less will do. Just adding some shiny new techniques on top of business as usual – what we call the "tinsel approach" – does not work in the long term because the same underlying messages of the medium persist. We are aiming to develop strong mental habits in our students that will stand them in good stead for a lifetime, and that takes time and consistency. Habits take months, even years, to develop and change. Students' development depends on the day-to-day cultures we create for them to inhabit, not on something special we remember to pay attention to every so often. And to create those cultures, we teachers have to be conscious, resilient, and imaginative learners too.

The beauty of the LPA, though, is that it relies on a series of adjustments that are worked into your natural style one by one, gradually and cumulatively. You are not

3 Cited in Ron Ritchhart, *Creating Cultures of Thinking: The 8 Forces We Must Master to Truly Transform Our Schools* (San Francisco, CA: Jossey-Bass, 2015), pp. 230–231.

being asked to transform yourself from a leopard into a tiger overnight. It is evolution, not revolution. The LPA is a direction of travel, supported by signposts and resources to guide you along the way, and everyone can go at their own pace. The good news is that, on the journey, teaching the LPA way becomes highly satisfying and rewarding. A roomful of enthusiastic, resourceful learners, who are keen to sort things out for themselves, is a sight to behold – and a joy to teach. Instead of doing a lot of informing, explaining, and interrogating, your role develops a subtler side to it in which you spend more time nudging and challenging the students to "go deeper" – as we'll see in this first account by Tracy Goodyear, a high school English teacher.

> I was teaching in a mixed comprehensive school[4] that had received a "good" Ofsted grading and the school was on a journey to transform the quality of teaching and learning to "outstanding". As part of this journey, senior leaders asked for volunteers to join a group that would help to revolutionise the quality of teaching and learning across the school – the opportunity was too good to turn down. I feel that the depth of understanding I gained helped to transform my practice and the results were immediately tangible – suddenly my lessons were more engaging for *all* students; I noticed that the usually more reluctant students came to the fore to share their observations; I noticed the quality of the work that students were producing had improved; I noticed that they were able to capitalise on previous learning and apply it to new and unfamiliar situations with confidence. It worked!
>
> As with any approach, there are potential pitfalls. First, it became clear quite quickly that there is an absolute necessity for all staff to believe in and crave the challenge of building learning habits in students of all abilities. Without this level of commitment from teachers, the students will not commit fully either, and the approach becomes superficial and redundant.
>
> Second, with accountability on teachers for grades at all costs, many critics are sceptical of spending time "talking about learning" when there is pressure to cover content or teach to the test. However, it's clear that in order to gain the grades, students need to show individuality of thought; they need to have their own opinions; they need to have had the opportunity to embed knowledge and understanding; and to be able to articulate how that process happens.
>
> The content is the vehicle by which we teach young people how to learn. It is important that this is made explicit. The content will change over time; habits can be formed to manage new challenges, and developing these is our real responsibility.

4 In England, comprehensive schools are non-selective state-funded high schools.

Seeing this transformation really gave me the confidence to experiment with learning habits and it opened a series of exciting possibilities for my lessons and the ways in which I could develop students' learning "character".

About the Book

Because this book is designed to be really practical, there isn't much in the way of background or rationale about the LPA in it. We only say a little about where the approach comes from, what the scientific underpinnings are, and what the evidence for its effectiveness is. You will find all of that, if you are not familiar with it already, in the first book in this series, *The Learning Power Approach: Teaching Learners to Teach Themselves* (published by Crown House in the UK and Corwin in the US). The only thing worth noting here is that the LPA is not another "brand" competing for your attention in the crowded education marketplace. It is our attempt to discern the general principles behind a number of initiatives that have been developing, often independently of each other, over the last twenty years or so. It is a new school of thought about the kind of teaching that effectively stimulates the growth of agile, tenacious, and inventive minds – as well as getting the grades. You will find examples and ideas from a wide range of sources, and from different countries, as well as from our own research and practice.

The book you are reading now is actually one in a series of four books, of which *The Learning Power Approach* is the first. The second is aimed specifically at primary school teachers. This, the third, is, as we have said, for high school teachers. And the fourth will be for school leaders, to illustrate in detail how LPA culture change can be brought about across a whole school.[5]

Will the LPA work in your classroom? We are sure it will. We have seen it work well in a variety of settings in the UK – from inner-city comprehensive schools in London to rural schools in Devon and Lincolnshire, in adult education colleges in Argentina, and in independent schools in Dubai, Malaysia, Australia, and New Zealand. The

5 Throughout this book, we have borrowed or adapted some text from the second book in the series. We are very grateful to Guy's primary practitioner co-author, Becky Carlzon, for allowing us to make use of her insights and expressions, and for her generous support in the planning of this book.

examples, tools, and techniques with which this book is crammed have been tried and tested in a wide range of settings. But you will probably still have to experiment with them in the specific conditions of your classroom and adjust them to get them to work for your students. Every school and every class is different; there's no getting around that. One size rarely fits all.

With over forty years' experience working as a teacher, senior leader, head teacher, school inspector, and education consultant, Graham has seen at first hand thousands of teachers providing their students with experiences that engage their curiosity and build their capacities as learners. Teaching is an intensely creative profession that requires flexibility and ingenuity. This cannot be provided by rigidly following a scheme of work or adhering to a textbook. What other profession requires its people to invent up to eight different performances a day, each of which is designed to suit the needs, moods, and enthusiasms of an ever-changing audience? Graham's experience has taught him that – now more so than ever – teachers need a supportive framework on which to build inspiring lessons that will serve the needs and expand the capacities of their diverse learners. That is what the LPA provides.

> The content is the vehicle by which we teach young people how to learn.

A learning-power classroom has many varied sides to it. Teachers lay the furniture out in a different way. They choose different things to display on the walls. They involve the students more than is usual in designing their own learning. They use a specific vocabulary when they are talking to students, and encourage specific kinds of talk between the students. They create particular kinds of activities and challenges. They comment on students' work and write reports differently. Over time, we have distilled a clear set of design principles to capture these differences that teachers can follow if they want to make their classroom a highly effective incubator of powerful learning.

And with that introduction, let's now dive into Chapter 1 and see in more detail what the LPA is all about.

Chapter 2

Learning Power Teaching in Action: Some Examples

In this chapter we will take a close look at ways of teaching that expand students' learning power. We will take you into real classrooms where we can analyse exactly how teachers who are well-versed in the LPA orchestrate their lessons so that their students are stretched to become more independent and resourceful. Our four examples come from teachers in a variety of international contexts, working with students of different ages and ability levels, in a variety of different curriculum areas. We will – as indeed we will throughout the book – insert frequent opportunities for you to examine the approaches along with us, and to ask your own self-reflective questions.

Before we begin, you might like to think about a lesson that you have taught recently. Ask yourself if, in hindsight, you can see any ways in which you could have got the students thinking and discussing more, and listening to you slightly less.

Wondering

Can you think of any small ways in which you could have created more opportunities for students to explore issues for themselves?

Were you, perhaps, rather too keen to drive them towards a standard "right answer", at the expense of encouraging original ideas and critical questioning?

How did you respond when a student gave you an answer that was not what you had in mind already? What messages could your response have conveyed about your priorities, or about the kind of learner you want them to be?

Now let's dive straight in with our first example: a geography lesson observed by Graham a year or two ago.

Exploring a Contentious Issue in Geography

Andrew Crampton teaches geography in a multicultural high school – King Edward VI Handsworth School for Girls – in the city of Birmingham, UK. The school has been developing the LPA for a number of years. This lesson was taught to a class of 14-year-olds and is the first in a sequence on the causes and implications of migration, a topic that will continue for several weeks. The lesson is designed to challenge students to explore contentious related issues for themselves. Andrew is committed to telling the students very little – instead requiring them, through collaborative discourse, to build understanding for themselves.

When the students enter the classroom at the beginning of the lesson, they are confronted with a compelling image on the interactive whiteboard. Andrew cues them with a familiar thinking routine – See-Think-Wonder – which asks them to look carefully at the image, noticing the details; think about what they are seeing and possible interpretations; and then start wondering more widely about the context and composing the larger questions which the image raises in their minds. The image, which was hard to interpret, actually showed a Mexican migrant who had been sewn into a car seat, apart from his head, in order to be smuggled across the border into the United States.[1]

Working in pairs to try to decipher the image, the students share their thoughts and observations, and generate a number of their own questions:

- Is this person disabled?
- Is he braced into the seat?
- Is this some kind of practical joke?
- Is he hiding from someone?
- Does he look more concerned, trapped, frustrated, or resigned?
- Who has taken the picture?
- Where in the world is he?
- How recently was this picture taken?
- What kind of car is this?

Andrew uses the See-Think-Wonder routine to probe their efforts. He keeps asking, "What are you seeing? What is that making you think? What does that make you wonder?" In this classroom – as is habitual across the whole school – the teacher follows a "no hands up" policy. All teaching is designed around

1 See Amanda Macias, This may be one of the boldest attempts we've seen someone make to enter the US illegally. *Business Insider UK* (20 July 2016). Available at: http://uk.businessinsider.com/man-attempts-to-illegally-enter-us-by-disguising-himself-as-a-car-seat-2016-7.

questions to which all students could reasonably be expected to have something to offer, so teachers can pick on any student to share what they are thinking. Andrew treats all their responses with polite interest, sometimes asking them to justify their thinking with reference to what they can see in the picture, and invites further discussion by asking questions like, "Does anyone agree or disagree with that idea?"

Having heard many suggestions, and without saying whether any of them are right or wrong, Andrew discloses the "split-screen objectives" for the lesson:

> "By the end of the lesson you will have explored some of the reasons why people migrate from one country to another. We will be looking at Mexico as an example of this.
>
> "And you will have exercised the following learning habits: noticing, questioning, exploring, analysing, listening, and empathising."

Guided by these dual objectives, the students are asked to look again at the picture with fresh eyes, underlining Andrew's intention of encouraging them to stay open-minded and think flexibly. In his classroom, deeper understanding emerges from such cycles of observing, thinking, and discussing, so students are unafraid to offer conjectures and then change their minds in the light of further reflection or new information.

Wondering

At this point you might like to stop and compare Andrew's way of starting the lesson with your own. Think about the way in which you start your lessons – do you:

Ever plan to use these kinds of dual objectives that focus as much on *how* your students will learn as *what* they will learn?

Consider withholding your objectives for a while, giving students the opportunity to generate questions and discover things for themselves? Would

you consider that to be a waste of time, or a luxury that you can't afford (because you have so much content to plough through)?

Make use of intriguing or puzzling images to stimulate your students' curiosity?

Consciously warm up the learning muscles that students will be using in the lesson?

At this stage, the students are asked to listen to an account of a character, Pedro, who is looking at his family's life chances in Mexico and weighing up whether he should leave or stay. Andrew says he will read the account – which will take about five minutes – and students should capture as much information as they can diagrammatically, pictorially, or graphically – but they are not allowed to use words. They are given time to discuss how best to capture information given this constraint, and are also asked to discuss what they hope to find out from Pedro about migration. A short plenary collects the following suggestions from the class about the information they are hoping to glean:

- The factors influencing a potential migrant's decision.
- Characteristics and problems of life in Mexico.
- Hopes and aspirations for a new life in the United States.
- Potential risks and hazards for an illegal immigrant.

They also think about how they might capture information:

- Drawing simple pictures to represent people and ideas.
- Using a flow diagram to sequence events.
- Compiling a spider diagram to connect bits of information.
- Listening for a while before putting pen to paper.

- Remembering to ignore irrelevant material.

After they have listened to Pedro's story, the discussion groups share what they have learned. Andrew then asks individual students to suggest reasons why people might choose to migrate from one place to another. Using Pedro's experience, but also drawing on what they already know from other sources, they come up with the following suggestions:

- Seeking better job opportunities.
- Avoiding hardship and disease.
- Accessing material comforts.
- Gaining better educational opportunities.
- Securing healthcare.
- Providing for family and children.
- Escaping from a war zone or area of conflict.
- Being safe from political persecution.

Using the *no hands up* approach, Andrew asks a range of students with different levels of ability and confidence to explain their reasoning, and this enables him to gauge their understanding and adjust his teaching accordingly.

Wondering

Do you use the same methods as Andrew to engage, stretch, and monitor students' learning?

How do you gauge levels of students' understanding during the course of a lesson? Or do you wait until you mark their written work in order to make

those judgements? If so, do you see any costs to waiting until after the event to find out how well they have understood the lesson?

Do you ask diagnostic questions that enable you to monitor students' ongoing levels of comprehension?

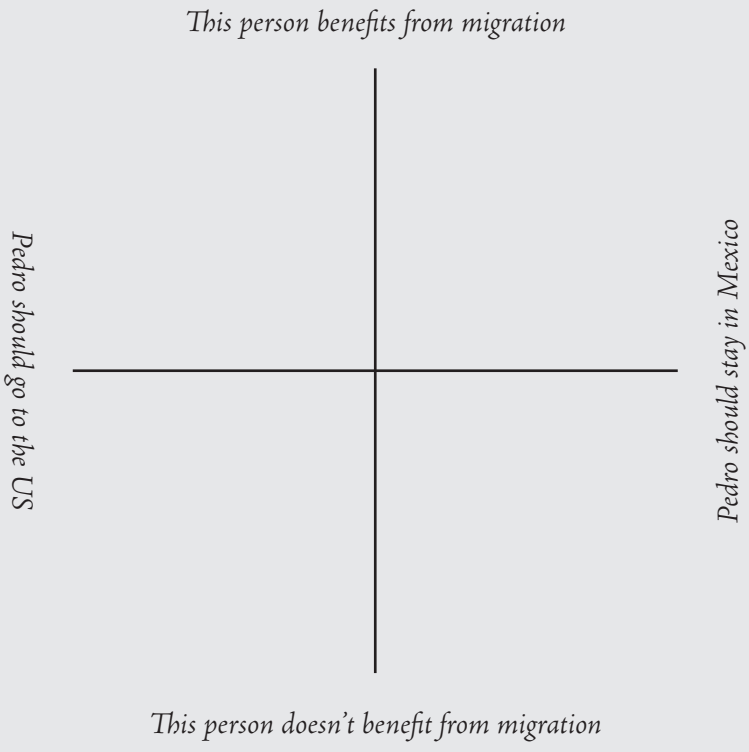
At this point, Andrew wants to raise the level of challenge and have his students evaluate what a variety of people might think about migrants coming to the United States from Mexico.[2] He distributes a sheet of eight brief quotations (that he invented for the task), which represent various standpoints. For example, a US fruit farmer says:

> Most Americans hate illegal immigrants but they don't realise how much our economy depends on them. My farm would not be profitable without Mexican workers. I employ lots of illegals – there is always work available. They might not earn as much as Americans but they don't pay any tax. I think if a Mexican is willing to save and work hard they can build a good life for themselves here.

At the foot of the sheet are the names of two other interested parties – a border patrol guard and a Democratic congressman – with no quotes attached. Students are asked to make up plausible opinions to represent those roles, and are encouraged to empathise – using their imaginations as well as researching through discussion or accessing the Internet – to determine what these people's views might be.

Next, working with a different partner, students have to plot where each of the ten characters' opinions would sit in a four-quadrant diagram that gauges the pros and cons of migration and makes them consider whether Pedro should stay or go.

2 Note that this lesson occurred before all the hoo-ha about Donald Trump's "wall".



Again, Andrew raises the challenge. Having empathised with different points of view collaboratively, students are now required to decide for themselves where they stand, quite literally, on the issue of migration into the United States from Mexico. They have to position themselves along a line that spans the full width of the classroom; one end of which corresponds to *Pedro should definitely go* and the other to *Pedro should definitely stay*. The class is spread evenly along the whole line; some standing at the opposite ends but many undecided and scattered between the two. They are asked to turn to the person nearest to them to discuss their position. After a few minutes' conversation, the groups who are at either end have to distil their reasons and elect a spokesperson to represent their case – for or against Pedro staying. While these presentations are in preparation – for which they have one minute – those in the middle have to discuss what they need to know in order to help them make a decision. During the presentations students

are free to change their position in response to the arguments. At all times the teacher simply acts as a facilitator, listening carefully to the discussions and probing when any points seem to be missing, or are expressed unclearly. Andrew uses questions like:

- So what are the risks that an illegal immigrant is taking?
- What might be the unintended consequences of that decision?
- What is the likely impact of mass migration on Mexico itself?
- What should someone who commits to stay despite the difficulties do?
- What makes the United States an unattractive place these days?

Pause again and think about the ways in which this teacher has been stretching one particular learning habit: the students' capacity to listen to, and learn from, others.

Wondering

Could you identify a specific learning habit that it would be useful for one of your classes to develop?

How might you progress this habit within and across lessons?

How explicit would you need to be with your students about this?

Back in their seats, students summarise their emergent understanding of migration by creating a spider diagram to organise their thinking. In the centre is written, "Migration: what I know and what I need to know." To help them do this well, they are reminded of a thinking routine called Generate-Sort-Connect, in which they first review all the things they have learned, then try to tidy them up by sorting their ideas into conceptual piles, and finally draw a diagram that

shows how these different piles and concepts relate to each other. They are asked to continue this task as their home learning assignment.

If we stand back, it is clear that Andrew has woven together many of the design principles of the LPA:

- He has tried to make students *feel safe* enough to explore issues, and they were required – with *increasing challenge* – to express personal understandings and opinions. They were encouraged – from the visually arresting starter onwards – to try out tentative ideas and suggestions, to express contrary points of view, and to know that – even if they were in the minority – their views would be respected but they would need to justify their opinions.
- Contemporary issues were presented in *compelling and stimulating ways* through a variety of cumulative experiences that engaged and stretched students so that they wanted to learn more – within the lesson and beyond.
- There was ample time for *conversation and collaboration* in a range of contexts with different class members.
- The *level of challenge* increased from stage to stage in the lesson to ensure that there was real progress in learning for all students.
- Using *split-screen objectives*, Andrew showed the importance of *how* students were learning as well as *what* they were learning – he commented regularly on the *learning process* during the lesson.
- *Thinking routines* were used as an aid to independent – and collaborative – learning. The work of Ron Ritchhart at Harvard on making thinking visible has been a focus at the school, so students are used to being given independent routines for thinking across the curriculum. There were two such routines in this lesson: See-Think-Wonder at the outset to aid attentive noticing and Generate-Sort-Connect towards the close to draw the strands together and as a precursor to further learning.

- The lesson was orchestrated so that students were working out for themselves what they thought about this contentious issue. Although Andrew told them virtually nothing, his Socratic style of questioning and probing led them *to fine-tune* their thinking and make it more *rigorous*.
- Students were being required to *take personal responsibility* for *how* they might work and *what* they might think.

Wondering

What is your overall impression of this lesson?

What did you like about it?

What did you dislike or disagree with?

What are some of the "yes, buts" that occurred to you? Lack of time? Risk to order in the classroom?

What questions has this example raised in your mind about how to plan and design your own lessons?

Thinking Like a Scientist

Now to our second example. Eric Levine teaches science at Springfield Renaissance School in Massachusetts, in the United States.[3] His tenth graders are coming towards the end of a series of lessons exploring a live scientific topic: the rapid global growth of bacterial resistance to standard antibiotics. These 15–16-year-olds have been given resource packs which contain magazine articles on the topic, as well as one or two original research papers that they will struggle to understand, for them to study and discuss. To bring the subject closer to home, they have been working as teams to detect the presence of antibiotic resistance in different places around the school. They are shocked to discover that about a third of their samples showed antibiotic resistance – and the greatest resistance is in places where cleaning products are used the most.

At the start of the lesson Eric has arranged the chairs in a large circle so all the students can see each other. They are each preparing a short talk in which they will discuss the issue of antibiotic resistance and present their findings. To do this well, Eric reminds them, they will need to sharpen their ability to think, talk, and write like scientists. To this end they have been watching online videos of real scientists making presentations, in order to carefully identify what it is they are doing. The students have distilled this learning into a poster – which they call an "anchor chart" – that summarises the key points they have observed. Figure 2.1 shows a neatened-up version.

3 This example comes from the DVD that accompanies the book *Learning That Lasts: Challenging, Engaging, and Empowering Students with Deeper Instruction* by Ron Berger, Libby Woodfin, and Anne Vilen (San Francisco, CA: Jossey-Bass, 2016). The lesson is described briefly in the book on pages 34–35. The quotes used in this description are all transcribed from the video, which is also available on the EL Education website: https://eleducation.org/resources/thinking-and-speaking-like-scientists-through-a-science-talk.

Thinking, talking, and writing like a scientist

- **Listen respectfully to each other.**
- **Build on each other's ideas.**
- **Respond to each other's questions.**
- **Make eye contact with your audience.**
- **Keep to the point: be concise and relevant.**
- **Don't talk about yourself too much.**
- **Explain the problem you are addressing clearly.**
- **Use proper scientific terminology.**
- **Give reasons and evidence for your claims.**
- **Comment on the validity and reliability of evidence.**
- **Cite your sources.**

Figure 2.1: Tenth Grade Science Anchor Chart

Source: adapted from Berger, Woodfin, and Vilen, *Learning That Lasts*, accompanying DVD

Eric begins the lesson with some guidance about how to structure their talks. First, they should be clear about which of the guidelines in the anchor chart they are each going to take as their specific focus for development. As they go around the classroom, one student says, "My focus is going to be making sure I use the right scientific terminology." Another says, "I'm going to focus on ensuring that all my statements are backed up by evidence."

Then they need to ensure that their talk is structured around a logical sequence of questions. For example:

1. Is antibiotic resistance a global threat? If so, why?
2. What does the research say about it?
    i. The published research?
    ii. Our own research?
3. What can be done about it?
    i. By scientists and experts?
    ii. By doctors?
    iii. By politicians?
    iv. By the public?
    v. By school students?

The students set to work in pairs to prepare their talks, mostly helping each other out, and occasionally checking in with their teacher. In conversation, one young woman says, "Our teachers hold us to high standards. We have got so good at being academically orientated because we have been building up to this since sixth grade." A male student says, "For me, thinking like a scientist means taking in what others are saying and reflecting on it, and then offering our own interpretations and ideas." When they deliver their talks, Eric is happy to find that most of the students perform beyond his (already high) expectations. After the talks, each student fills in what they call their "exit slip" where they reflect both on what they have learned about the science, and also on the development of their ability to "think and talk like a scientist". Eric reflects that the task seems to have been a successful culmination to the overall exploration, and has been effective at engaging the students and making the issue real for them.

The spirit of the LPA is clearly alive and well in Springfield Renaissance School. The school is a member of the EL Education chain, so we would expect nothing less. We see the students learning through extended, tightly designed projects that engage and stretch their thinking and learning in specific ways. The scientific content is embedded in a real issue that is topical, important, and challenging, so they are fully engaged in what they are doing. Students are doing most of the work – and they are working hard! They have to read some material that really stretches their understanding, and they often work together to sort things out for themselves, as much as they can, before calling on the teacher as the last resort.

They are challenged to distil from the videos they have been watching the distinguishing features of proper scientific talk, and to practise embedding these characteristics in their own ways of thinking and presenting their ideas. The task is made more precise by the teacher, who asks them to zoom in on a particular feature that they are going to pay special attention to. So the development of scientific understanding, on the one hand, and the skills of scientific thinking, on the other, are woven seamlessly together. The cultivation of useful, transferable, disciplined ways of thinking sits right alongside the acquisition of reliable and rigorous knowledge.

We see the students learning through extended, tightly designed projects that engage and stretch their thinking and learning in specific ways.

Notice also the judicious balancing of structure and responsibility in the lesson. Eric is explicit about the valuable skills and dispositions which he wants his students to develop – this is clearly no laissez-faire free-for-all – and he knows his class well enough to be able to design activities that pull them to the edge of their current competence, and both sharpen and strengthen their capacity for precise, respectful, well-considered thinking and conversation. He knows that these capacities will not be developed simply by listening to him lecture and copying down notes to be memorised. Thinking and talking only develop through thinking and talking – so that is what most of the lesson involves. His concern is not just to squeeze good grades out of them; it is to produce citizens who are

confident, knowledgeable, and articulate enough to raise the level of debate in whichever forums they find themselves. So the students' task, on this occasion, is preparing and delivering a talk, rather than writing an essay or a conventional lab report. Their comments suggest that they understand and appreciate the authenticity of the task, and rise to the challenge. Allowing the time for them to craft a presentation that is as good as they can make it teaches them that the effort they put in is handsomely repaid in the pride they feel in a "job well done".

As the students become even more ready, willing, and able to take control of their own learning, we might expect their teacher to stretch them still further. Eric could, for example – as many LPA teachers do – go on to involve them in choosing their own topics, sourcing their own readings and videos, figuring out a good general structure for the talks, and deciding the best ways of organising themselves to prepare for their presentations. Eric probably judges that this group is not quite ready for that step. But they soon will be.

Wondering

Students of this age would be in their GCSE year in the UK, so it might be tricky to plan such projects then. But for what year groups could you design a version of Eric Levine's lesson? How would you have to change things for a Year 7 class? Year 9? Year 12?

Do you like the idea of watching real live scientific role models at work, and getting the students to infer the rules of scientific discourse for themselves?

Do you think Eric has got the balance between structure and responsibility right? Think about a class you teach at the moment. Would they need the task to be more or less structured than Eric's is?

"We've been building up to this since sixth grade." What kinds of activities do you imagine these students have been given that have helped them get

ready for such an adult project? To what extent does your school plan such activities?

Do you agree that building up this confident, articulate "scientific literacy" is part of a science teacher's job?

Delving into a Poem

In our third example, Helen Watts is teaching a Year 12 English class the poetry of Sylvia Plath in a Norwich comprehensive school. As Eric did, she wants her class to make meaning and understanding for themselves; specifically, to learn to read a poem in a fresh and forensic way that they will be able to apply when looking at other poems in subsequent lessons.

The poem in question is Plath's "Mushrooms" and Helen knows that there is much more to it than an initial reading might suggest. The poem consists of eleven three-line stanzas, each line just five syllables – on the surface, a very simple poem. Without telling them the title or the poet, Helen explains to the class that they are going to read the poem closely in order to understand its possible meanings and explore the effectiveness of its language. She has cut the poem up into its constituent stanzas and gives each pair of students a different random stanza. None of them, as yet, know what the poem is about.

They have two minutes to look at their three-line stanza and generate a hypothesis about what the poem's title might be, based on this evidence. At the end of the two minutes Helen takes away their first stanzas and gives them each a second stanza to ponder. She reminds them to keep their minds open and think as laterally as

possible. To help, she gives them a version of a thinking routine called "I used to think … Now I think …" They have to fill in the blanks in the frame:

> I thought the poem was about _____ because _____, and now I think it's about _____ because _____.

After another couple of minutes she takes the second stanza away and asks them to stand up.

For the next three minutes, they leave their partner and meet with as many other individuals as they can – all of whom have read different stanzas. They use the thinking routine in their conversations with others and gather as many different ideas as possible in the time allowed. They return to their partner to share perceptions and inch towards a title. Helen asks different people to come up with suggestions based on what they have gleaned. Some of the possibilities that emerged were:

- Snowfall
- Hibernation
- Oppression
- Revolution or Uprising
- The Industrial Revolution
- Trees of the forest

Like Andrew in the earlier example, Helen is inclusive of all suggestions without judgement but always asks students to justify their hypotheses. She then provides them with another thinking routine: "What do we know? What do we need to know?" Following a discussion in table groups of four, the class as a whole arrive at one essential observation:

> Although the poem may be about one thing on the surface, it may actually be a metaphor for something else … so what is the poem about?

With their curiosity piqued, she provides them with the full poem – cut up and placed in a plastic wallet. Since she is committed to developing their capacity to organise their thinking methodically and systematically – in other words, to think and plan before they act – she requires some forethought from each pair. So, given that the eleven stanzas are randomly shuffled, she sets them to discuss the question, "What do we need to do to make sense of the poem?"

Following some of this *learning-design thinking*, the following suggestions are shared across the class by the students:

- Spread them all out on the table so that we can see what we've got.
- Identify the ones we know already.
- Look for any stanzas that might link to other stanzas.
- See if we can we identify any "end stops" or "run ons".
- Identify what stanzas might start the poem.
- Identify what stanzas might end the poem.
- Try to work out an order that makes sense.

None of these suggestions came from Helen. The students open their wallets and get to work – reminded that they are trying to work out what the title of the poem is.

Take a moment to pause and ask yourself some questions about how the lesson so far compares with your own teaching style.

Wondering

Do you often design lessons to pique students' interest?

Do you use the same kinds of methods as Andrew and Helen?

If not, what are your preferred approaches?

Do you see any merit in their methods?

Do you train students to think more carefully and subtly by providing them with templates to follow, like the thinking routines we have mentioned? Do you think this is a good idea?

Do you get them to think or talk about good ways of dealing with a problem before they start? Or do you tend to offer them only one way – yours – of going about learning?

You might also like to look back at the elements of learning power in Figure 1.2 (on pages 22–23) and ask yourself which of the elements students are being asked to make use of in this lesson.

While the students are working, Helen is asking herself the same questions. She is observing how her students are behaving as learners, knowing that this is an invaluable way of gauging their levels of engagement and understanding, as well as how they are managing the challenge. After five minutes or so, she says, "You have two minutes and then I want you to tell me how the poem starts and how it ends." This really focuses them to think with urgency and precision as they know that they will be required to justify their decisions.

With twenty-four students in the class, Helen numbers them all from one to six and asks them to get into groups with the students with the same number. They have five minutes to arrive at a consensus decision about the beginning and ending, which they can justify to the class as whole. Each group identifies a spokesperson and a class debate follows – with Helen taking a back seat as the discussion takes place between the students rather than always through her.

When asked, "Would you like to know how the poem begins and ends?" the class are eager – although some say that their decision looks justifiable no matter what the poet actually wrote. Helen reads the first and final two stanzas. "So," she asks again, "what is the title of the poem?" Still in their groups of four, they continue to

sequence and sort the stanzas, talking all the time about what the poem is about. There are plenty of disagreements, second thoughts, and uncertainties. One girl says, "I thought it was oppression but now I think it's about something more natural … I still think that there's a deeper meaning even if it is about flowers or something …"

Wondering

Just pause again to think about the ways in which you develop your students' *socialising habits*. Do you:

Get them to devise their own plans of action?

Make them work with a wide range of people in different-sized groups?

Expect them to adopt different roles and responsibilities?

Encourage them to work together to meet tight deadlines?

Require them to be open-minded and to review or revise work in progress?

Now it is decision time. Each group offers a title and provides a justification:

- Clouds – because it's about something building up before a storm.
- Revolution – because it's about a gradual change that is about to overturn things.
- Rabbits – because it's about a population explosion.

Helen invites the class to challenge these emerging theories by asking students to draw attention to any parts of the poem that don't seem to fit. And when she again asks, "Would you like to know the title of the poem now?" she gets a loud chorus of yeses. Before she tells them, she says, "Once you know the title, we'll read the poem with this in mind and identify descriptions that seem particularly

accurate." She shows them a time-lapse film clip of mushrooms growing, and – linking what they have seen with what they have read – they come up with the following observations:

- "Nobody sees us …" describes the stealthy way mushrooms arrive in the dark and overnight.
- "Soft fists insist …" captures the shape of mushrooms as they force their way to the surface.

After more discussion Helen gives the class a further instruction: "Now find examples where the sound and rhythm of the poem seem to complement what is being described. See if you can find the names for these techniques." Students begin to notice the finer points of Plath's poetic style, such as her use of vowelling, assonance, and alliteration, and come to see how these techniques complement the meaning and feeling of the poem. Students share insights such as:

> "The use of a range of complementary vowel sounds – night … white … discreetly … quietly – really feels like something is opening up almost imperceptibly."
>
> "The assonance – toes … nose … hold … loam – makes them sound assured and confident as if they are determined something will happen."
>
> "'Nudgers and shovers/In spite of ourselves' makes me think that nothing will hold them back – they can't help themselves from pushing forward."

Some students begin to suggest that, although the poem is clearly about mushrooms, it could also be about something else. Helen tells the class a little about the life of Plath and her place as a forerunner of feminism and poses another investigative question: "In what ways can we read the poem as feminist literature?" This challenge led to further group discussion, with some students arguing that this is a justifiable reading of the poem and others disputing it.

As in Andrew's lesson, we see a style of teaching that centres on getting students not just to *know* – to be able to trot out facts and received opinions that will get them a good mark on an old-fashioned test – but to *think*: to discover, explore,

discuss, and come to their own judgements on the basis of evidence and reason. The subject matter is different but the feel of the lesson is similar. Of course, no one can think in a vacuum, but that does not mean that young people need to be stuffed full of facts before they can be considered qualified to think about them. They come to know and understand more deeply and accurately through the processes of investigating, imagining, and critiquing. And the more the curriculum is crammed with prescribed content, the harder it is for teachers to see how they can afford the time to let proper learning happen. But these examples show that it can be done – as it must be if we are to grow supple minds that are equal to these challenging times.

Problem-Solving in Mathematics

Now to our final example: a maths lesson with a mixed-ability Year 7 class. As well as being a school leader with the responsibility for learning and teaching at South Dartmoor Community College in Devon, UK, Katie Holt teaches mathematics across the age and ability range. On the surface, this lesson is about understanding how to work with percentages; however, Katie has embedded a deeper purpose, which is to stretch her students' mathematical problem-solving capacities. She is quite explicit about her intention and reiterates what she has said to them in earlier lessons:

> "Remember, I'm not here to just teach you the maths – I want you to think like mathematicians."

This was the second in a three-lesson sequence on problem-solving. Katie was inspired to look at two-way tables for this problem-solving lesson after reading a blog post on how this topic is often overlooked in maths, but will flummox students who haven't been taught how to think logically.[4]

4 Craig Barton, Two way tables – GCSE maths insight of the week 6. *Mr Barton Maths Blog* [blog] (25 October 2015). Available at: http://www.mrbartonmaths.com/blog/two-way-tables-gcse-maths-insight-of-the-week-6/.

Wondering

What does it mean to *think like a mathematician*? Do you know how real mathematicians think? What kinds of things do they do when they get stuck, do you suppose? Did your maths teachers talk about this when you were at school?[5]

Look again at the elements of learning power in Figure 1.2 (pages 22–23). Which are the key learning habits that would be useful for mathematicians to develop in the early years of their high school education?

Think about one class and focus on a couple of the elements that you've identified. Think about the students who seem to be in the habit of thinking in these ways. What characterises their learning behaviour? Now think about those students who need help to think in these ways – what could you do as their learning coach to stretch these capacities?

How do these habits need to change and progress as students grow older and become more skilful mathematicians?

To warm up the learning muscles that they will need, Katie presents the class with a series of four increasingly difficult non-mathematical riddles.

1. Give me food and I will live; give me water and I will die.
2. Everyone has this; it's with you wherever you go. You can't wash it off, but when you touch something, there it will stay.
3. I have holes in my top and bottom, my left and right, and in the middle. But I still hold water.

5 For more on this you might like to look at Kevin Houston's work on thinking like a mathematician, see: http://www.kevinhouston.net/pdf/10ways.pdf.

4. I can run but not walk. Wherever I go, thought follows close behind.[6]

They can get their heads round the first riddle quite easily but the ones that follow are more challenging. They get the students stuck and lend themselves to more lateral thought and possibility thinking. The students are well-used to this kind of approach to maths in Katie's lessons and set about the problem enthusiastically. You can hear them saying: "So what do we know? … What could it be? … It might be … It can't be, because …" It's clear that they don't want Katie to provide them with quick answers; they're keen to work things out for themselves. Nevertheless, Katie keeps the lesson moving at a good pace so that there is a balance between urgency and reflection. By the end of this exercise, her students have warmed up the learning muscles that they will need during the rest of the lesson.

Katie asks the students to identify those approaches and elements of learning power that have already helped them act as effective problem-solvers. They said:

"We asked ourselves *what are the facts*."

"We tried to link thinks together."

"We asked ourselves, '*What could it be*?' "

"We let our imaginations run free."

Moving on, the students are told that they are going to solve a "mystery". This is another approach with which they are familiar. She tells them that they are going to receive some information on ten cards (displayed on page 56) but she is not going to tell them anything more about these or what they need to do. As you can see, the cards describe the nature and organisation of an adventure holiday, but the information needs to be carefully considered and reordered before students can begin to decide what maths they can draw on to help them solve the problem.

6 Answers at the end of the chapter – how long can you hold out before you give in and look for the answers?

100 Year 9 students went on an adventure holiday.	To solve the mystery you have to think methodically; consider carefully how you record your results!	Work out how many boys and girls there were on each activity.
Half the girls went mountain walking.	The sailing activity had an equal number of girls and boys.	There were 25 people who went mountain walking, and 80% of them were girls.
49 people went rock climbing.	Rock climbing was the most popular activity.	Three-fifths of the people on the holiday were boys.
On the rock climbing activity there were six times as many boys as girls.		

Figure 2.2: Mathematical Problem-Solving

Source: Katie Holt

Her next instruction is really important:

> "Before you start doing any maths, I want you to spend five minutes thinking strategically. When I looked at your last piece of problem-solving it was obvious to me who had thought before they started. Quite a lot of you just jump in without stopping to think. I want you to come up with a plan for solving the mystery – think about some of the ways that you worked with the riddles just now and see if you can decide what you can take from that and apply to what I'm asking you to do this time."

She underlines what she is expecting by telling them to "use the Think-Pair-Share routine". They take the next five minutes seriously, and ask themselves useful questions as they think about how they are going to approach the problem:

"So, what are these cards about?"

"What is the most important information?"

"Some of this looks irrelevant, how can we decide whether it is?"

"Can we begin to link any of them together?"

Having let them discuss this for a couple of minutes, Katie offers them another thinking tool:

"You might find this thinking routine useful: What do we know and what are we trying to find out?"

They turn back to their group planning, and after five minutes Katie comments on how well they have been thinking:

"I have heard some great strategies … I'm impressed by those of you who have been looking back and applying what you did last time."

Having built in plenty of reflection time, most students have been able to think through what the information is telling them, summarise what they know, determine what they don't know, and trawl through their prior mathematical knowledge to find those skills they've acquired in earlier lessons. It is clear that they are being stretched to think for themselves, to tolerate uncertainty, and to recognise that it's sometimes necessary to make false starts and allow themselves to start over again.

The group talk is illuminating:

"We have to work out … first."

"I don't think that really matters."

"If we have to find out … why would we have this information?"

"We haven't figured that out yet."

"So what have we used?"

"That can't be right – how can you have 8.16 people? 8 people and a finger …"

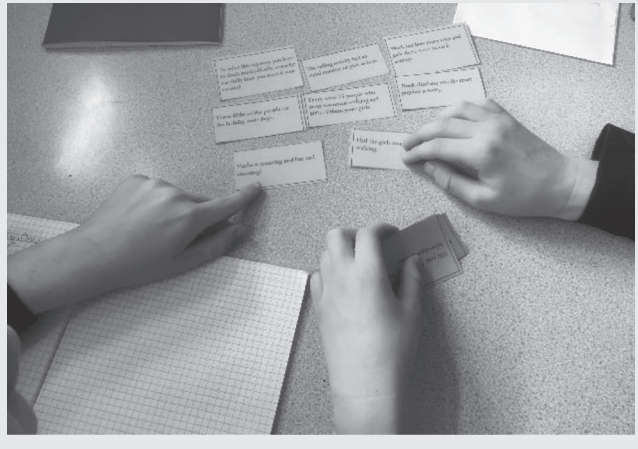
"Shall we put this to one side?"

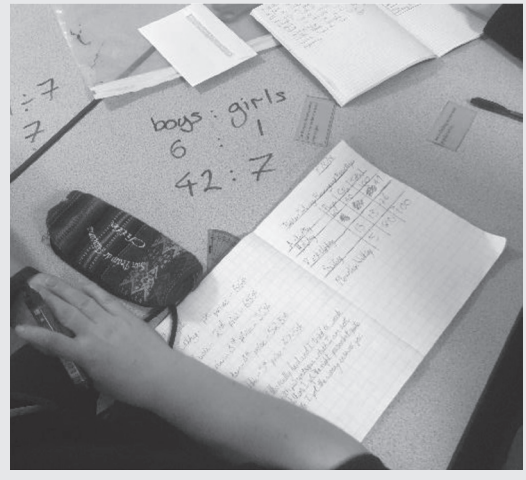
"So we've got it wrong – how shall we start again?"

"OK – you do it your way and I'll do it mine and we'll see what we get."

"So … there are … therefore … we need to …"

Students now begin to make calculations and work out – using what they know about calculating percentages – how many girls and boys were engaged in the different outdoor activities. But not all of them have been able to manage their thinking so effectively. Katie has spotted this and homes in on the groups that are floundering.





Katie's role while the students are working things out for themselves is crucial. She has her eyes and ears about her; she isn't just checking whether her students seem to be on task, she is listening in order to gauge *how they are thinking* and whether this is productive. Katie intervenes with prompts and nudges that help students to work things out for themselves. She listens and poses questions to stimulate them to think clearly and carefully, and then walks away. If individuals are getting frustrated, she sits down with them and asks probing questions. She writes down their ideas on their wipe-clean desk tops so that they can see things more clearly for themselves.

She sits down with two students who have recently joined her group and are unfamiliar with her approach, and gently unlocks their thinking through patient questioning. She acknowledges their frustration, validates it, and offers them a way of getting started:

> "You're looking a bit stuck. It seems like you're feeling really frustrated – that's OK, you'll get used to this way of thinking soon – let's have a look at what you've got and see if we can find a way of getting started ..."

Consistently, when her students ask her direct questions she will reply: "Think about it and then ask me a better question."

At one point she says to the class as a whole:

> "In maths, we obsess too much about how to get the right answer – I want you to be trying out different possibilities."

Katie has carefully designed the working groups in this mixed-ability class so that all are challenged and supported appropriately. She doesn't allow students to sit with whomsoever they wish but knows her class well enough to group them as productively as possible. She explained to Graham:

> I start my seating plan with the disadvantaged students and those with special educational needs (SEN). Next I put in my best learners, with an eye to who will work best with whom. This group of Year 7s much prefer to be in single-sex groups so, for the moment, most of the groupings are all girls/boys. Finally, I mix the rest of the learners into the seating plan, strategically separating certain characters and ensuring that each group has a good dynamic and a harmonious balance of learners.

As the lesson progresses, Katie allows some groups to break into smaller units, if they think it would be helpful, and she has also prepared some support material which they can access if they want. She has prepared clue cards in envelopes which help her students to structure the task. She provides cards that suit the levels at which students are operating, as well as a template of the two-way table for those who need it.

Draw a two-way table to organise your results	Extension: Did you need EVERY clue card to solve the mystery? Which of the clue cards could possibly be left out?	There are 40 girls in total

49 people went rock climbing	Extension: Choose a clue card that you can replace with a **fiendishly** difficult clue (that gives the same information)

	Mountain walking	Rock climbing	Sailing	Total
Girls				
Boys				
Total				

Figure 2.3: Katie's Cues and Extension Questions

Source: Katie Holt

The commitment to encouraging reflective and strategic thinking, and helping students to understand themselves as metacognitive learners, is a strong feature of the lesson. Katie finds opportunities to draw the students' attention to effective ways in which they have been working. She says things like:

> "I am impressed by the strategies that some of you have used … by those who got themselves unstuck … those who said it's not impossible."

Observing how the new students react to Katie's lesson is instructive. They gave in quite quickly, showed frustration when they got stuck, contributed little to the group, and didn't have any language for talking about the process of learning, or

for reflecting on themselves as learners. Katie is alive to this and knows how to work on building up their learning habits and confidence.

As the activity draws to a close, with students having worked out the answers to the "mystery", Katie leads a whole-class discussion that focuses on the ways in which they have arrived at their solutions. This is not the end of the lesson, however. Katie has allowed time for two more activities that build on what her students have been learning. The first is a formal exam question.

Think-Pair-Share

30 pupils were asked about their lunch one day.

The table gives some information about their answers.

	School dinners	Sandwiches	Other	Total
Girls	12	3		16
Boys	8		2	
Total				30

Figure 2.4: A Trial Examination Question

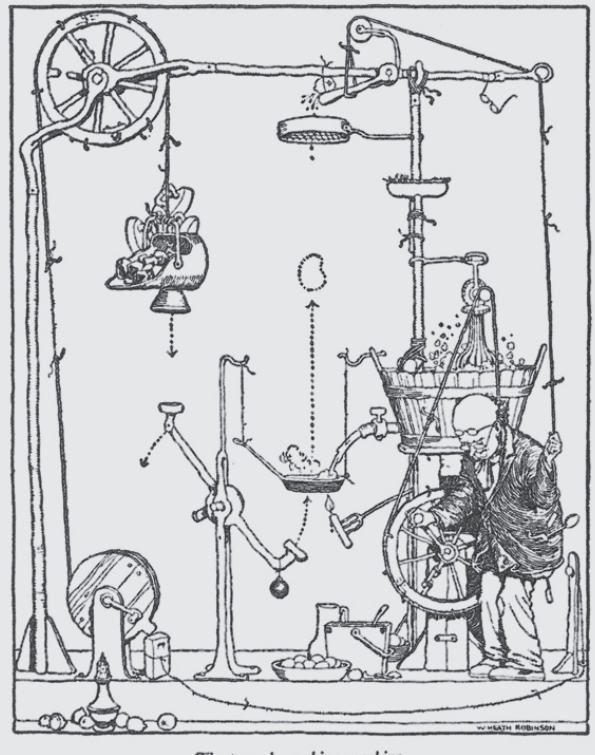
Source: Katie Holt

Second, Katie shows them an image of a complicated imaginary machine drawn by William Heath Robinson.[7] Their job is to figure out what the machine is for, and how it works, by following the sequence of events and triggers that lead – eventually – to the making of a pancake. Graham wanted to be clear how this

7 This image is widely available online by searching "William Heath Robinson pancake-making machine".

complemented the lesson and wasn't just a tricksy way of bringing things to a close. Here's what Katie said:

> The picture exemplifies how methods work in maths, especially when problem-solving. You cannot jump straight to the answer. You have to work out one thing which gives you the information to work out the next thing and so you work your way along a chain which results in the thing you want. I use the same "chain of reasoning" picture to explain the reasoning in many find-the-missing-angle questions. You have to be a detective and follow the clues to the answer using logic at each step – that's being a mathematician rather than just "doing maths".



The pancake-making machine

Figure 2.5: A Heath Robinson Machine

The students are asked finally: "What are the learning habits that you are using here that are useful when thinking like a mathematician?"

> The specific learning habits in this lesson were thinking rigorously and methodically. No step can be left out and every step has to be done in (more or less) the right order. It was important for me to make sure they really understood this since they will need to use these habits when we move onto our next topic, which is solving equations. Students tend to think of maths as a load of discrete topics that they learn about in splendid isolation. I want to underline the links between them and the way the learning habits are so important because they will help them in every single topic.

One of the aims of Katie's teaching – at all levels but particularly with these 12-year-olds – is to enhance their *metacognition*: their ability to stand back and think about their own thinking. To achieve this she:

- States clearly at the start of the lesson how they will be working and what learning habits and routines they will be drawing upon.
- Draws attention to a wall display on learning habits and asks them to discuss and then comment on the habits that they think they might be using.
- Provides genuine choice so that students get used to making decisions for themselves.
- Makes sure her students frequently recognise and explore the transferability of their learning into other contexts in school and beyond.
- Builds in time for further evaluation of the learning by each student. They are given time to write about the lesson in their exercise books: to record what they found difficult, how they have progressed as – in this case – problem-solvers, and what they need to attend to next time.
- Ensures that marking of books involves comments about their evaluations with suggestions for further action – as both mathematicians and learners.

Katie commented:

> One particular student this year keeps asking me, "What's the point of maths?" To solve this problem I have stuck a poster of careers that you need maths for to his

> desk – and it's his job, every time we meet some new maths, to look for a job in which that particular maths is crucial. Sometimes I ask students to come up with their own examples of where else they might apply these problem-solving skills, especially if I feel we are in danger of becoming too abstract – putting the current topic in a stand-alone box without making any links to other subjects or real-world applications.

Katie Holt is as reflective as a teacher as she wants her students to be as learners. She often makes an audio recording of the lesson that she plays back afterwards, enabling her to gauge the nature of the talk between students when she's not with them. She may share these observations with the students in subsequent lessons, drawing attention to the kind of productive talk she is looking for and asking them to come up with protocols which might make for more effective collaborative work.

Wondering

How do you start your lessons and signal those learning elements that will be used in the lesson?

What part does the conscious development of students' capacity to think about themselves as learners play in your lessons?

How and when do you intervene when students are learning autonomously – on their own or with others?

How do you enable your students to develop self-awareness, self-regulation, and self-control?

Do you empower your students to exercise choice and make decisions for themselves?

Summary

In this chapter we have looked in some detail at lessons in different subjects and with different year groups. These teachers are all skilled practitioners of the LPA, and we hope you have been able to detect the spirit and purpose behind their methods. What they are doing – what any experienced teacher does – is a highly skilled performance, on a par with conducting a symphony orchestra or coaching a squad of Olympic athletes. But that virtuosity can be assembled bit by bit, with the right support. We are firmly of the belief that teachers are made, not born, and that anyone, pretty much, can become an excellent teacher if they are willing to experiment and learn. Being an expert LPA teacher is just one way of being an excellent teacher – as Andrew, Eric, Helen, and Katie are. In the following chapters we will pull this expertise apart, show you in some detail what it is made of, and explain how to build your own capacity to teach the LPA way.

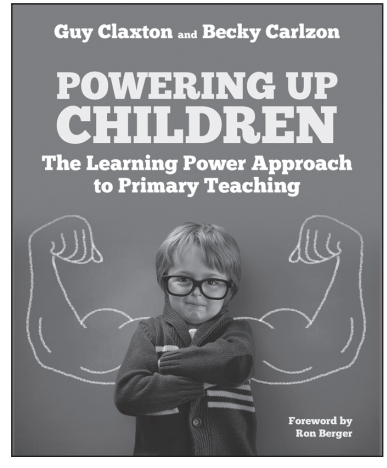
Answers to the riddles on page 54: fire, fingerprint, sponge, and nose.

Powering Up Children

The Learning Power Approach to Primary Teaching

Guy Claxton and Becky Carlzon

ISBN 978-178583337-3



Building upon the foundations carefully laid in *The Learning Power Approach*, the first book in the Learning Power series, Guy Claxton and Becky Carlzon's *Powering Up Children* embeds the ideas of this influential method in the context of the primary school.

It offers a thorough explanation of how the LPA's design principles apply to this level of education and, by presenting a wide range of practical strategies and classroom examples, illustrates how they can be put into action with different age groups and in different curricular areas – especially relating to literacy and numeracy, but also in specific subjects such as science, history, art, and PE.

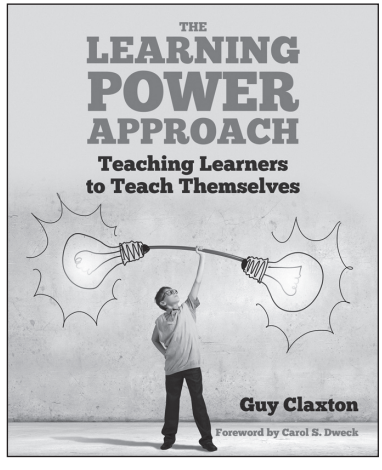
Suitable for both newly qualified and experienced teachers of learners aged 3–11.

The Learning Power Approach

Teaching Learners to Teach Themselves

Guy Claxton

ISBN 978-178583245-1



In this groundbreaking book, Guy distils fifteen years' practical experience with his influential Building Learning Power method, as well as findings from a range of kindred approaches, into a set of design principles for teaching.

Complemented by engaging and informative classroom examples of the Learning Power Approach (LPA) in action – and drawing from research into the fields of mindset, metacognition, grit, and collaborative learning – *The Learning Power Approach* describes in detail the suite of beliefs, values, attitudes, and habits of mind that go in to making up learning power, and offers a thorough explanation of what its intentions and guiding principles are. Furthermore, in order to help those who are just setting out on their LPA journey, Guy presents teachers with an attractive menu of customisable strategies and activities to choose from as they begin to embed the LPA principles into their own classroom culture, and also includes at the end of each chapter a "wondering" section that serves to prompt reflection, conversation, and action among teachers.

An immensely practical and solution-focused book. Its content is highly accessible and brings the ideas being discussed to life – making it really easy for teachers to integrate the Learning Power Approach (LPA) in their own settings, whatever the subject or phase.

Sue Plant, Head of School, John Taylor Free School, UK

An essential book for any teacher wishing to help young people to achieve outstanding academic results and be prepared for the challenges and opportunities of the 21st century.

Neil Tetley, Principal, Hastings School, Spain

The techniques and strategies that Guy and Graham have packed into *Powering Up Students* will boost the learning capacity of students, teachers, and school leaders.

Paul Byrne, Deputy Director, National Association of Principals and Deputy Principals, Republic of Ireland

Teeming with ideas, as well as practical and illustrative examples of the LPA in action, *Powering Up Students* really shows high school practitioners how to become better LPA teachers.

Rachel Macfarlane, Director of Education Services, Herts for Learning Ltd, UK

Powering Up Students is a wonderfully practical guide for high school teachers of any subject who are committed to tweaking their practice to ensure that students build up their learning power as well as achieve good grades.

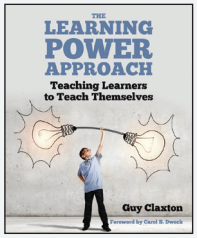
Margaret Rafee, Principal, Sri KDU International School, Malaysia

Powering Up Students is a book that practises what it espouses, and so it is of great instructional value to both teachers and school leaders, as well as to those involved in the preparation of all professionals working in high schools.

Ian Potter, Executive Head Teacher, Bay House School and Sixth Form, UK

Powering Up Students will empower high school teachers to make changes in their classroom practice and help them to enhance students' ownership of their own learning.

Hjordis Thorgeirsdottir, sociology teacher, Sund Upper Secondary School, Iceland



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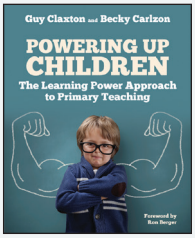

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