

How to use the six learning hormones to switch students on



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Before we start...

What if you could invite David Attenborough, Ron Weasley's mum, Nigella Lawson, Jeremy Clarkson, the Bodyguard and Doctor Who into your classroom, drawing on the unique characteristics of each to make lessons more interesting and effective? Well you can, if you know how to control the six learning hormones they represent.



There's an iconic scene in 'The Wizard of Oz' film when Dorothy's dog Toto tugs away a curtain to reveal that the amazing Wizard is actually a man who pulls levers to create an illusion of power. One lever deepens his voice, another releases plumes of smoke and a third produces bright flashes of light.

Teachers are expected to be classroom wizards by putting on pyrotechnic displays to rival New Year on London's South Bank every day. If they don't, observers just tut and tick the box marked merely 'adequate'.

But, like the Wizard, to create a powerful impact you simply need a set of powerful levers to pull. For teachers, these are the 'six learning hormones', each of which has its own unique characteristics, just like Jeremy Clarkson and Nigella Lawson et al.

So, let's introduce our cast of characters.

Testosterone (Jeremy Clarkson)

Testosterone is the hormone that keeps us alert, focused and competitive. By encouraging resilience and perseverance it helps us rise to a challenge rather than give up. Both boys and girls need good levels of testosterone to feel in control.

Movement and noise keep testosterone levels elevated, but these are the very things schools tend to steer clear of because in most lessons they indicate chaos and anarchy. However, children who are kept quiet, still and obedient also need moments when they are offered choice, control and the potential for jeopardy.

They must be able to choose how to tackle problems and challenges, or given the opportunity to work in teams where there is a meaningful degree of competition, jeopardy and rewards for the victor.

Children need to look good in front of their peers, to be seen to excel and to receive plaudits and praise. When that's done across the class, every child can discover their own strengths and demonstrate these to others. This is the basis of rites of passage challenges that teenagers have performed for millennia in different cultures around the world.

Taken to excess, however, the need to impress can be problematic. Risk-taking behaviour, for instance, increases when children are with their peers, rather than adults, or alone (1). Typically, teenage drivers carrying teenage passengers drive faster than when they are on their own or with an adult passenger (2). Testosterone also impairs thinking. In one test, a testosterone gel applied just once to a group of men resulted in them buying higher status products than those in a control group who received a placebo (3).

The strutting Jeremy Clarkson inside all of us was essential to early human success, enabling our chimp-like ancestors to push aside more passive species of lemurs who once ruled forest canopies and now remain only in Madagascar, saved by an ocean barrier (4). Testosterone is still important. If children are not taught how to use it appropriately the consequences in classroom and country can be catastrophic. Aggression, assertiveness, acquiescence and compliance are crucial behavioural choices we all need to learn to be healthy adults.

Cortisol (The Bodyguard character)

Limit testosterone release too much and we inadvertently increase its partner hormone cortisol.

Cortisol is one of our body's emergency services. It's the equivalent of Richard Madden in the hit TV drama *Bodyguard*, coiled tight as a spring, hyper-alert to potential danger and totally focused on his immediate surroundings. Great in an emergency, much less so when it comes to learning anything new.

Worse still, if cortisol and other related hormones remain too high for too long, this can have significant adverse consequences, preventing effective learning and even compromising the immune system.

It's for good reason that cortisol is known as the 'stress hormone' and we certainly don't want too much of it in the classroom mix. As it is, in an average class of thirty, three children are likely to suffer from mental health issues. You can add to that the ten who have separated parents, seven more who have been bullied and the six who have self-harmed (5). So teachers who aren't pulling the right levers could be seen as either cruel or misguided.

Gamification, concept tests and physical activity are all ways to help get levels of cortisol and testosterone into optimum balance.

Serotonin (David Attenborough)

Serotonin is the hormone that most makes us human because it binds us together with others in groups, tribes, gangs and spiritual beliefs. It enables us to dissociate from ourselves so we can see a bigger, better picture, and allows us to feel awe and wonder. Just think of David Attenborough narrating over moving footage in one of his documentaries. We feel deeply connected to the planet, content both as an individual and as part of one universe. William Blake summed up the impact of serotonin in his sentence: 'If the doors of perception were cleansed man would see the universe as it really is; infinite.'(6)

While high levels of testosterone cause aggressive, lone-wolf and self-destructive behaviour (7), when it's paired with serotonin, bravery and altruism result.

Too little serotonin, on the other hand, leads to loneliness, which is as damaging to our health as smoking or obesity (8), and when absent for prolonged periods it also results in depression.

Oxytocin (Mrs Weasley from Harry Potter)

Oxytocin is referred to as the cuddle chemical. Oxytocin is a comfort blanket, the parent figure that reassures, much like the mothering Mrs Weasley from *Harry Potter*. Not surprisingly, oxytocin levels are at their highest in women during and immediately after childbirth, strengthening feelings of deep love between mother and baby. But it helps with bonding at other times too.

Oxytocin is the counterbalance to cortisol and testosterone and it has an intoxicating effect in the classroom, calming, relaxing and creating contentment while boosting creativity and recall. Its calming impact is the perfect balance to the energy, focus and intensity delivered by testosterone, and the perfect hormone for times of reflection.

Oxytocin has a measurable positive impact on exam performance, which is why many universities recruit animals at this critical time so students can get an oxytocin boost from petting them (9). Schools who apply similar principles to calm students by using music, pictures or anecdotes to boost oxytocin, also see a performance improvement.

In addition, oxytocin has medicinal properties. Hamsters in social groups heal faster than those isolated from others. Even those kept apart heal faster when given a daily injection of oxytocin (10).

So, oxytocin is a key lever that teachers can use to build resilience, a much-lauded aim in education, though one that's difficult to define.

Even the toughest Year 11 asked to mentor a Year 7 at football or show them around the new school enjoys an oxytocin explosion that benefits them as much as

their advice benefits the mentee. The positive impact of mentoring programmes has been widely observed (11), most recently in Channel Four's Old People's Home For Four Year Olds. Here, when elderly residents and the children followed a three-month programme of joint activities, there was a measurable positive mental and physical impact on both. If they'd measured oxytocin levels they would probably have increased as well.

Endorphins (Nigella Lawson)

Endorphins are feel-good chemicals that peak when we are in 'flow'. They also bathe the body in a protective glow that shields us from pain (12). If you've ever been gardening, played golf, or done some other activity only to notice half an hour later an injury you didn't know you had, that's down to endorphins hiding the pain so you can continue doing what needs doing.

Endorphins are our Nigella Lawson. She who caresses even the most unlovable vegetable, coaxing it from ugly duckling into beautiful swan, the stunning centrepiece at a sophisticated dinner party.

If you can coax a student to become totally engrossed in an activity, they will be learning at their peak, and encouraging this is the big prize in the classroom. So, if you can wrap up content and knowledge within a story or in a puzzle, you will ramp up learning.

Because endorphins foster concentration and help us contemplate new ideas and concepts, they are the perfect hormone for solitary, focused and detailed work. Unlike oxytocin and serotonin, which are more beneficial when it comes to discussions, group activities, problem-solving, and the consolidation and transfer of new knowledge to long-term memory.

Consider which is the most beneficial mix for the learning, and design the activity to fit.

Dopamine (Dr Who)

This is the star of the show (13) because it stimulates neurones to connect and create thoughts and memories. In the right amounts, it's the hormone that underpins all lessons and learning. Like the Doctor in Dr Who, it bounces us from one amazing adventure or learning experience to another, whether that's in the classroom or in time and space. There's just a slight pause for breath ... and a new adventure begins.

Dopamine facilitates the brain's main raison d'être, which is to learn and create memories. It forges meaning and learning through a magnificent alchemy, as it uses both a simple on or off switch at synapses and is part of the most complex structure in the known universe, our brain, with

billions of neurons connected at the speed of electrical currents.

Dopamine is a precious resource, and the most successful teachers are those continually looking to release small dopamine hits through probing questions, tasks, challenges, facts and experience that help the learning and memory happen without the student consciously concentrating. Done well, lessons fly by and learning is smuggled into the student's mind with little apparent effort.

Unfortunately, dopamine has a brutally short attention span. So, if it's triggered by something dull, insufficiently novel or which doesn't quickly yield a reward, dopamine says goodnight and literally turns out the lights, so no electrical current crosses between synapses, no information is exchanged, and no memories are formed.

However, dopamine hits are highly addictive. Drugs such as heroin and sugar have dopamine enhancing pathways at their core. Gambling is also dopamine-based. Addictions switch on all the Christmas tree lights at the same time, if this becomes the norm, the personal cost can be high.

When I shared this article with a teacher they sighed and said: 'So I've got to be Nigella Lawson, David Attenborough, Jeremy Clarkson, Mrs Weasley, that Bodyguard bloke and Doctor Who in every lesson!'

Well, not quite. But a great teacher prepares lessons that tap into all these characters so as to release the full range of relevant hormones in children and create a delicious learning soup. TV programmes like 'Bake Off', 'Pointless', 'I'm a Celebrity Get Me Out of Here!' or 'Strictly' are successful because they know how to release all six hormones in just the right mix throughout the show.

So, even if you're an energetic drama teacher with certificates to demonstrate your acting range, it's still better to let children generate these six hormones for themselves. Remember, you're the director, not the lead.

When children are provided with strategies for planning, monitoring and evaluating their own learning, pulling and directing the levers of their own hormones, they learn how to live, as well as how to learn. This is metacognition at its best, what researchers consistently rank highly for its classroom impact (14). Strategies will be presented in a future article.

After a revision boot camp session at which I'd shared brain-friendly ideas to make revision easier, three girls challenged me to make river erosion interesting.

So, I asked them to work as a team (that generated oxytocin release) and to choose a random item from one of their handbags (that caused a dopamine rush), then link

this (serotonin release) to the key facts about river erosion. They had all the knowledge they needed to do this, so were in control (testosterone release) but if they needed help, they could ask.

The girls picked out a perfume and then presented together (cortisol with serotonin) an alternative brand they called HAAS.

The H stood for 'Hydraulic' — one girl sprayed perfume onto her wrists and said this was like water hitting a river bank. A was for 'Abrasion' — the next girl rubbed her wrists together to mimic the action of rocks rubbing against each other, releasing more endorphins. They did similar things for 'Attrition' and 'Solution'.

Their presentation took twenty minutes, during which all three experienced the full range of hormones while making river erosion interesting.

Hormones really do influence behaviour, and finding the right balance between recklessness and bravery, anger and boredom, is surely a lesson best learned in the classroom.

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David Hodgson's bio in brief:

An author and consultant, David's unique blend of educational pedagogy and the latest neuroscience research enables teachers, students and school leaders to identify and capitalise on their natural strengths. His practical strategies for improving behaviour, confidence, resilience, as well as classroom and exam performance, help teachers and students alike to make faster, better progress. Using interactive sessions, David shares the secrets of great learning and rethinks how learning, memory and revision can be woven into the classroom experience. He covers topics such as the three key things all great learners do, and considers how best to apply the latest brain research and psychology of learning, retention, motivation and metacognition. David's published books include The Buzz, The Brainbox, Personality in the Classroom and The Little Book of Inspirational Teaching Activities.

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