

How we Learn

How do we learn?

A new world record for solving the Rubik's cube, breaking the elusive 5 second barrier, was set last year by a 14 year old boy from Kentucky. Lucas Etter achieved the feat in 4.9 seconds: which is not only astonishing but made even more impressive if the video is watched in slow motion.

One Dulwich science teacher has always been impressed by those who are able to solve this concrete riddle, invented by Erno Rubik back in 1974, and, on hearing of Lucas Etter's success, decided that it was about time that he learnt how it was done. He was told by some that it was 'easy', by others 'impossible'; however the sheer number of videos available online implied that all the tools were available to him, he just required some time, motivation and practice.

He started by watching videos which explained numerous methods of the "2FL" approach (two first levels) which to him at the time, made no sense at all. There were basic approaches, speed techniques, written instructions, animations and algorithmic codes which needed to be understood before he took his first tentative steps and, of course, there is the necessary lubricating of the cube to make sure you reduce your time by those all-

important half seconds! Whilst trawling through the information online he suddenly realised that he was attempting to learn a process, which is something he asks his students to attempt every day. Being on the other side of the teacher's desk was an unfamiliar sensation, but one of the best professional development experiences he had undertaken in recent years. Below are his reflections on how he best learnt this skill.

Looking at the puzzle in three dimensions and trying to move one block around was, he found, frustrating to say the least: indeed it is fortunate the design is so robust as it was often thrown, he confessed! It took time to really understand the characteristics of the cube, and to work out what an instructional video is trying to explain. Nothing, he found, can short cut this process: you need time, without distraction to fully immerse yourself in the task, and the last thing that helps is someone else jumping in to show you how it is done 'their way'. He often turned his iPad and phone onto airplane mode so the latest email didn't distract him, and it took a good 15 minutes to start really concentrating before the learning started to begin. During these periods, it was important to be resilient.

When learning something new, frustration sets in very quickly if you feel you are not

achieving what you see as progress; and keeping motivated through those periods can be tricky. You need to be resourceful. Our Science teacher ended up setting himself small targets; could he move that block to the same place again? Could he move it to the other side? Could he move it faster than he did before? Many of the pupils he teaches are quick to ask him for the answer to a question when they come up against something they don't understand. His response to them these days is "Now you're in the learning sweet spot! How are you going to work out the answer? Which tools do you have, and have you tried to solve this already or are you just looking to move on?" We can all see this learning sweet spot when, for example, we walk around the park and watch skateboarders practising their jumps, or children learning to ride a bike. The way they know they are not doing it right is when they get it wrong. But whereas some continue to practise, others give up. What is it that makes certain people keep trying? The learning sweet spot is a combination of making the challenge tough enough so we don't get it right all the time, and yet not so difficult that we are stressed by the challenge. This flow is where the level of challenge is just ahead of the level of skill.

In a future world where people are asking, "Who needs a teacher when you have Google?" the answer is that a teacher is required to provide the flow in a world awash with information where it is all too easy to experience information overload. Teachers are no longer the exclusive purveyors of knowledge, and learning doesn't only happen when pupils are in front of the teachers. Instead, knowledge is easy to find, but, when undiluted and unfiltered, it is overwhelming and there is no guarantee anyone is learning anything.

So how does this apply to learning an academic subject? What's the equivalent of the skateboarder falling over? Failing is a word that used to be associated with exams and underachievement: however failing is a constructive process by which you gain an understanding of what you don't know.

Pupils might be tempted to see a bad mark as a measure of their intelligence, viewing their performance compared with that of others as the most important measure, rather than looking at their own progress from their last test. These feelings have been driven by an educational system that is interested in the outcome of exams, and the consequence is a belief that "intelligence" is innate and unalterable quotient. Nothing could be further from the truth. The science teacher who tackled the challenge of the Rubik's Cube failed his first year exams at university, and thought about giving up Oxford until he spoke to his wise father who said: "Are the exams too tough or did you not try hard enough?" His problem was the latter, and he spent the next eight weeks re-learning, practising and making sure he was ready for the 'last-chance' retakes at the start of the following term. The magical ingredient for him was effort.

Carol Dweck's seminal work on growth mindset has slowly been adopted by schools in order to address this problem. Her research has shown that praising pupils on what they achieve creates an environment in which good results reinforce the wrong message. If good results reflect ability, then the converse is also true; bad results imply a lack of ability. Her research suggests that praising effort is the key.

The teacher spent a week on holiday practicing the Rubik's cube with written instructions. With the time available, lack of distraction, motivation of a swim or food when he achieved small goals, he managed to slowly solve the first levels in one day, the second in two days and finally the third whilst packing up to head home. That flow, resilience and effort over a week enabled him to complete the cube in five minutes at least twice and, on arriving home, he felt like a bona fide Rubik's cuber. One minute twenty seconds is now his personal record, and he was pleased to be able to beat one of the 'speed cubers' in Year 12 (but that might have been because he dropped his cube half way through: nevertheless, a win is a win!)

