



Talk about teaching and learning

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It is a regrettable, and somewhat ironic truth, that the daily activity of life in schools tends to limit the time we have to talk – perhaps even think - about teaching and learning. Creating opportunities for professional reflection to take place is, however, an essential ingredient for any school that declares itself forward thinking or research informed. And truly exciting cultural shift can take place when students, as well as staff, contribute to the development of a reflective narrative.

Many schools have found the means to make professional learning for staff more effective. One reason for this, perhaps, is to do with the increased in number of resources readily available that support the development of pedagogical enquiry. Apart from the number of accessible meta-analyses of educational research, such as that published by the Educational Endowment Foundation, Evidence Based Education and the Chartered College of Teaching there is a plethora of helpful books, websites, blogs, articles and videos from the likes of John Hattie, Tom Sherrington,

David Didau, Dylan William, Daisy Christodoulou and Doug Lemov, as well as many courses and conferences – one of the best examples being researchED, directed by Tom Bennett. Educational research has never been in a stronger position, aided significantly by developments in cognitive science and the robustness of its evidence. So called 'fads' come into existence far less frequently and claims once taken for gospel, for example, those surrounding Learning Styles, Multiple Intelligences, ability grouping, discovery-based learning and '21st Century skills' are shown to be empty of evidence basis. (Christodoulou, 2014, Bruyckere, 2015)

To harness this cornucopia of knowledge, professional learning in schools needs to be undertaken carefully. All too often it presents itself in the form of a one of 'CPD' session devoid of context or clarity of aim; teachers attend courses but not required to share their findings; books and journals are ordered and never read, subscriptions to relevant websites seldom utilised. The status quo is by and large no one's fault; it always comes down to the ever-present need for time.

Professional learning is best thought about in terms of different contexts. Whole-school CPD is an opportunity to bring all staff together and attend to matters of importance that relate to the school's strategic plan; making the aims and the time-scale clear are essential ingredients, and in many – if not most cases – themes

will emerge in different ways and be revisited over a period of time, whether weeks, months or years. Reflective practice should also take place, however, at a group or team level – for example in the context of individual departments. And finally, perhaps most importantly, its impact can be most readily felt when it forms part of our individual professional development. Here at Sevenoaks we are fortunate in that the Institute of Teaching and Learning can provide evidence-based support for more or less any area of independent interest, from implementing formative assessment to discussion based learning to behaviour management and lesson design. Finding ways to accommodate and embed various kinds of reflective habit – in and through different contexts, is essential to the ongoing development of motivated, professionally curious teachers, and of course most importantly, likely to result in improved outcomes for our students.

In addition to learning talk among staff, studies show that introducing students themselves to the language of learning and its associated practices, is of significant benefit. (Brown, Roediger and Daniel, 2014). It seems logical and sensible, if teachers are better informed about such things as the difference between long term and working memory, what it means to experience 'cognitive load', the relationship between auditory and visual channels, how to evaluate the use and efficacy of different learning strategies, the importance of information being encountered on three different occasions – and in different ways (Nuthall, 2007) – in other words, what learning actually is, then students would benefit considerably from the same understanding. In addition to knowing about learning, more effective students know how to learn (Ellis et al 2014): they are able to self-regulate; they consciously set goals for themselves; they understand the importance of, for example, self-explanation, spaced repetition, retrieval practice and interleaving – as opposed to massed practice (or cramming) in preparation for exams (Logan et al, 2012); they deliberately attack subjects or topics in which there are weaknesses; they review their learning and deliberately apply strategies they know will work. This kind of practice informs what is known as metacognition – thinking about thinking, the benefits of which are reported in a wide range of different studies. (Ellis, Bond, & Denton, 2014; Black and William, 1998; Gulikers et al, 2006). In the end, this means that students develop understanding of the efficacy of particular learning strategies, as well as how and when to implement them in reference to knowledge of their own strengths and weaknesses.

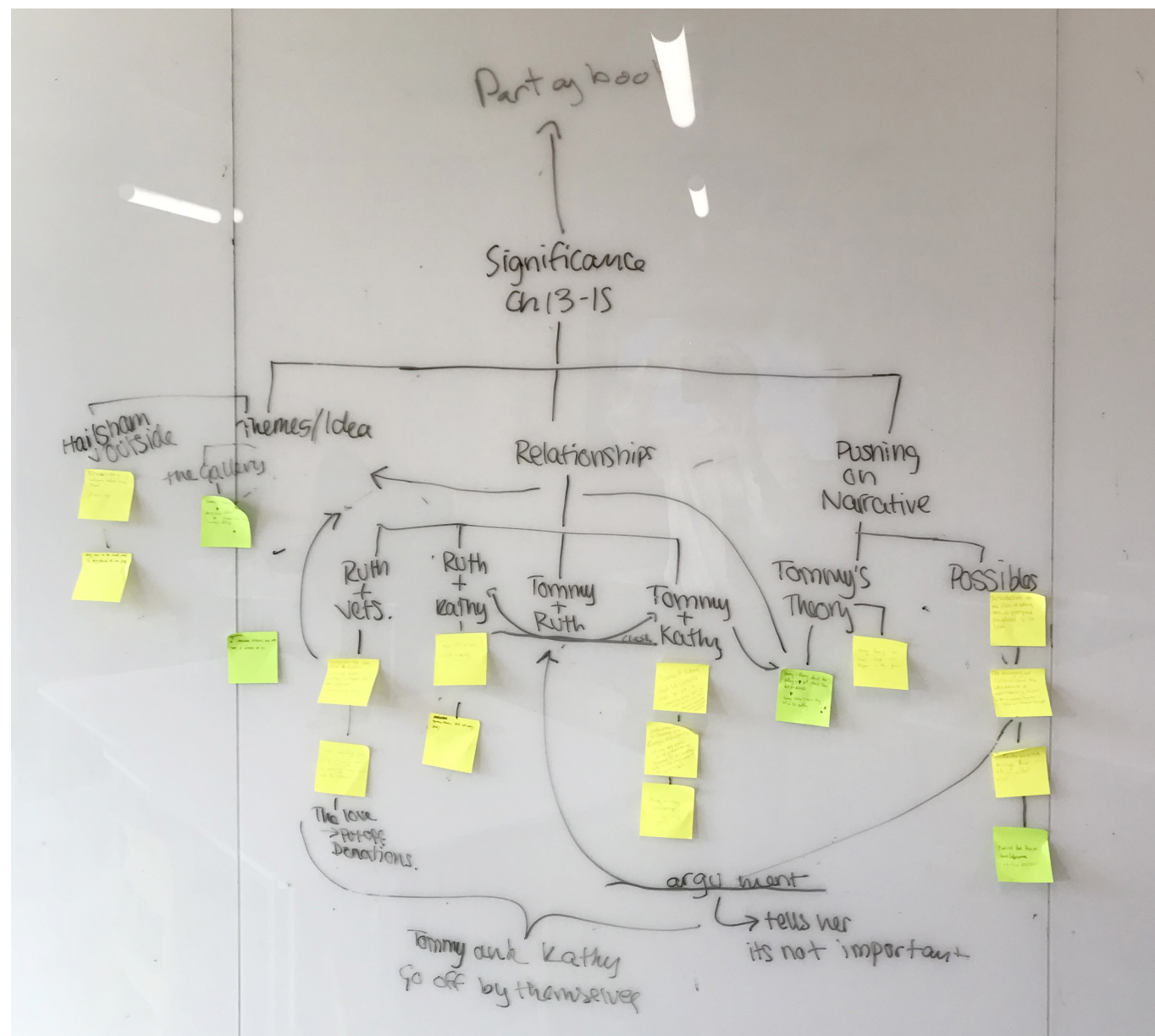
This is all well and good perhaps, but for students to develop self-regulated, reflective habits, they need to be taught them. Occasional or one off 'study skills'

sessions are not typically very effective, not least because students find it hard to apply generic skills into context specific situations. For metacognitive ability to come properly into being, it needs to be embedded in everyday classroom practice. Particular teaching strategies are shown to be more effective than others. A report published by the Education Endowment Foundation suggests the following as a series of steps to apply metacognition to learning a topic:

1. Activating prior knowledge
2. Explicit strategy instruction
3. Modelling strategy
4. Memorisation of learned strategy
5. Guided practice
6. Independent practice
7. Structured reflection

Defining features of these elements include explicit discussion of reasons why particular learning strategy (e.g., the use of a graphic organiser such as a fishbone diagram) should help generate understanding of the topic, modelling of the strategy and checking for understanding, as well as reflection at the end on why and how the strategy was useful. An example of this, as illustrated in the images below, is an English lesson designed to teach elements of essay structure. Students were shown a range of graphic organiser diagrams and discussion took place as to what kinds of connected information they would best portray e.g. hierarchical, temporal, conceptual. Following note making on any and all elements relevant to the essay title, students were asked to categorise their ideas on post it notes, and then organise them in accordance with a diagram that most effectively presented in their ideas in the form of an argument. Students therefore presented their thinking visually and at the end of the lesson discussion took place about the value of the approach, and its potential support for other kinds of inquiry in relation to different topics and subjects.

Other techniques that can help students to developing understanding of how learning happens include live modelling and thinking aloud: the teacher verbalises their own thinking as they model the solution to a problem for the class – and in so doing break things down, deal with the unexpected, explore ways in which difficulties might be overcome. Apart from the cognitive benefits of this approach, learning can be "humanised ... students need to understand that it is tenacity, not some innate talent, that will get them over the hurdles." (Thom, 2020). Asking students to talk out loud their thoughts and feelings as they set about writing an essay, for example, can have a similarly positive impact.



Deliberate and repeated practice is also essential – initially guided and then independent, as is the process of reflection before, during and after the event. What approach should we take as a class to learn this topic? How is our learning going? What could we have done better? Self-questioning has so much power, as does summarisation: The Week in Review activity (Ellis 2014) asks students to summarise what they have learned over the course of a week. Along with thinking about approaches to note making, summarising develops analytical and interpretive skills in selection, re-presentation, reorganisation and synthesis.

This year, we plan to introduce more opportunity for teachers and departments to develop reflective thinking about their practice. And we also plan to bring learning talk into the foreground with our students: a Middle School learning skills programme will address typical study skills but ask students to reflect on themselves as learners and acquire knowledge and understanding

what learning actually is; learning sites for both staff and students have been developed, which summarise important ideas about how learning happens and provide students with resources to help them to work independently; a staff and student learning committee will help us to evaluate the efficacy of our interventions and develop resources for the benefit of each other, as well as learners in contexts outside Sevenoaks School.

Daniel Willingham concludes his book, 'Why don't students like school' (2021) with the observation that student flourishing can be nurtured considerably through understanding of cognitive scientific principles. If the notion of flourishing is to exist as a core aim of the education we offer our students, finding opportunity to think and reflect, discuss and share principles and practices that can bring about this state – which is one of both thought and feeling – is surely a self-evident need.



“Can’t I just look it up?” The triumphs and pitfalls of tablets in classrooms.

James Tate, Head of Physics

Whether specifically asked, or just implied, all teachers have been faced with the question “Can’t I just look it up?” before. Students are often required to learn something but simply cannot understand why. Their day-to-day life is almost permanently connected to the internet; they can access all their music remotely, ask their virtual assistant about the weather or their to-do list, they constantly communicate with friends and family via instant messaging services and when they want to know something, they “google it”. With so much available at their fingertips, it’s easy to see how they feel that recalled knowledge is unnecessary. This may be largely true for their social lives, but when learning skills or methods, looking up each piece of required information is problematic as their working memory cannot usually handle it. We need to help them reduce the load.

“Working memory is the retention of a small amount of information in a readily accessible form. It facilitates planning, comprehension, reasoning, and problem solving” (Cowan, 2016). This is what we need our students to use while they are learning, whether

analysing a text or solving an engineering problem. But the average human’s working memory will not allow an international phone number to be memorised in one attempt. If this was briefly shown to you, it is unlikely you would be able to recall it accurately later:

+ 4 4 7 3 6 2 9 5 5 1 4 0 8

However, if we’re able to utilise our long-term memory, the task becomes much easier. Let’s say you know that “+44” is the country code for the UK and the mobile operator prefix “7362” is the same as a friend of yours has. They are now available from your long-term memory as single pieces of information. This leaves just seven pieces of information for your working memory. If you pair them and realise that the second of each pair is four fewer than the first, you have reduced the working memory requirements even further:

+44	7362	95	51	40	8
long-term	long-term	1st item	2nd item	3rd item	4th item

Each human’s working memory can handle an average of seven pieces of information, rarely fewer than five or more than nine (Miller, 1956). During the process of solving an IB or A-level Science problem, this capacity is likely to be exhausted. A student may need to know: two equations that can later be algebraically amalgamated, a couple of constants required for the calculation, values from the previous sub-questions, three numbers from the diagram at the top of the page and an accurate knowledge of the “principle of moments” in order to structure the answer (which has not been learnt beforehand because the student thought “Can’t I just look it up?”).

Surely this is where technology can help?

The number of students using tablets during lessons has increased drastically over the past few years, partly exacerbated but the periods of remote learning. Surely, we should find that these technologically-superior students are progressing best as they can outsource their working memory requirements to a machine? Unfortunately, it is unlikely to be that simple.

Imagine the average student in the average classroom using an average-sized tablet. Once they have opened the task and zoomed appropriately so that they can read the question fully and can see the answer box, there is not a lot more screen-space available. They cannot see the required equations (which are in a PDF version of the data book in a different app), they cannot scroll up to the diagram or previous sub-questions without losing sight of the question they are working on and although they can remind themselves of the “principle of moments” with a few quick taps in a web browser, this requires another different app that will probably take up the full screen. Phew – it’s tiring just thinking about it! By the